US010508658B2

(12) **United States Patent**
Park et al.

(10) **Patent No.: US 10,508,658 B2**
(45) **Date of Patent: Dec. 17, 2019**

(54) **AIR CLEANER**

(71) Applicant: **LG ELECTRONICS INC.**, Seoul (KR)

(72) Inventors: **Jaekyun Park**, Seoul (KR); **Hyunpil Ha**, Seoul (KR); **Soonki Jung**, Seoul (KR); **Yeongcheol Mun**, Seoul (KR); **Soohyun Bae**, Seoul (KR)

(73) Assignee: **LG ELECTRONICS INC.**, Seoul (KR)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/363,587**

(22) Filed: **Nov. 29, 2016**

(65) **Prior Publication Data**

US 2017/0248153 A1 Aug. 31, 2017

(30) **Foreign Application Priority Data**

Feb. 26, 2016 (KR) 10-2016-0023663
Jun. 22, 2016 (KR) 10-2016-0077888
Oct. 25, 2016 (KR) 10-2016-0139376

(51) **Int. Cl.**
B01D 46/00 (2006.01)
F04D 29/40 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***F04D 29/403*** (2013.01); ***A61L 9/22*** (2013.01); ***B01D 46/002*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC .. B01D 46/00; B01D 46/0008; B01D 46/002; B01D 46/0047; B01D 46/2403; B01D 2273/30; F04D 29/403; F04D 29/703; A61L 9/22; A61L 2209/11; A61L 2209/12; A61L 2209/14; F24F 3/16; F24F 7/007; F24F 13/10; F24F 13/12; F24F 13/14; F24F 13/20; F24F 13/28; F24F 2110/64;
(Continued)

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,210,429 A 7/1980 Golstein
4,365,980 A 12/1982 Culbert et al.
(Continued)

FOREIGN PATENT DOCUMENTS

CN 1487246 4/2004
CN 1510348 7/2004
(Continued)

OTHER PUBLICATIONS

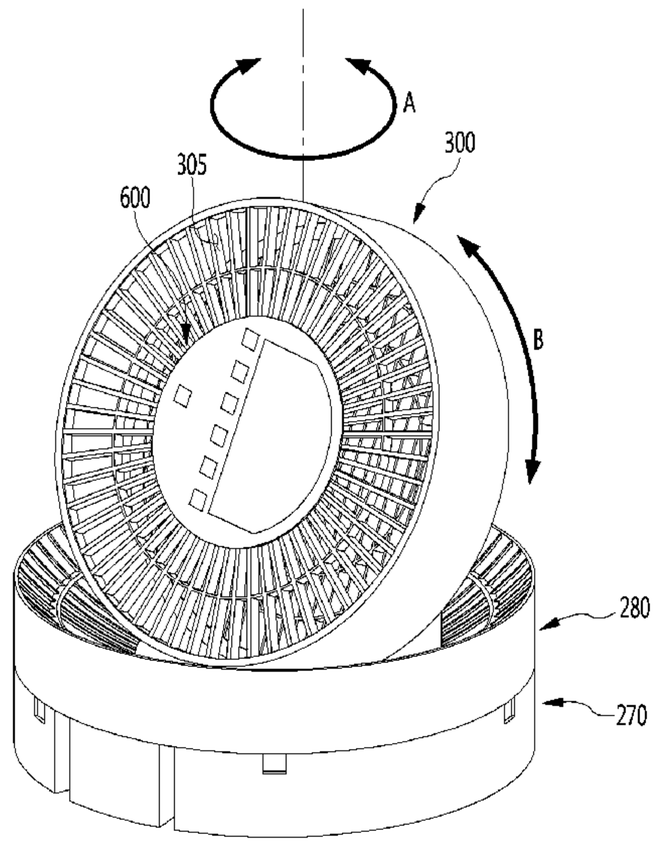
European Search Report dated Jul. 14, 2017 issued in Application No. 16201092.0.
(Continued)

Primary Examiner — T. Bennett McKenzie
(74) *Attorney, Agent, or Firm* — Ked & Associates, LLP

(57) **ABSTRACT**

An air flow controller for an air cleaner and an air cleaner are provided. The air flow controller may include a fan, and a housing, the fan being provided in the housing and the housing being movable from an initial horizontal position in which the air flow controller directs air flow in a vertical direction to an inclined position in which the air flow controller directs air flow in a diagonal direction.

13 Claims, 24 Drawing Sheets



(51) **Int. Cl.**

F24F 11/89	(2018.01)
F24F 13/12	(2006.01)
F24F 13/14	(2006.01)
F24F 3/16	(2006.01)
F04D 29/70	(2006.01)
F24F 7/007	(2006.01)
F24F 13/10	(2006.01)
F24F 13/20	(2006.01)
F24F 13/28	(2006.01)
B01D 46/24	(2006.01)
A61L 9/22	(2006.01)
F24F 11/30	(2018.01)
F24F 1/0071	(2019.01)
F24F 110/64	(2018.01)
F24F 11/52	(2018.01)

(52) **U.S. Cl.**

CPC ***B01D 46/0008*** (2013.01); ***B01D 46/0047*** (2013.01); ***B01D 46/2403*** (2013.01); ***F04D 29/703*** (2013.01); ***F24F 1/0071*** (2019.02); ***F24F 3/16*** (2013.01); ***F24F 7/007*** (2013.01); ***F24F 11/30*** (2018.01); ***F24F 11/89*** (2018.01); ***F24F 13/10*** (2013.01); ***F24F 13/12*** (2013.01); ***F24F 13/14*** (2013.01); ***F24F 13/20*** (2013.01); ***F24F 13/28*** (2013.01); *A61L 2209/11* (2013.01); *A61L 2209/12* (2013.01); *A61L 2209/14* (2013.01); *B01D 2273/30* (2013.01); *F24F 11/52* (2018.01); *F24F 2013/205* (2013.01); *F24F 2110/64* (2018.01)

(58) **Field of Classification Search**

CPC .. F24F 11/30; F24F 11/52; F24F 11/89; F24F 2001/0096; F24F 2013/205; F24F 1/0071

USPC 55/467

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,905,340	A *	3/1990	Gutschmit	A47L 7/00 15/316.1
5,117,652	A	6/1992	Takeuchi et al.	
5,264,015	A	11/1993	Matsui	
5,334,248	A	8/1994	Kwak	
5,641,343	A	6/1997	Frey	
5,753,000	A	5/1998	Chiu et al.	
5,837,020	A	11/1998	Cartellone	
6,053,968	A	4/2000	Miller	
6,264,712	B1	7/2001	Decker	
6,280,493	B1	8/2001	Eubank	
6,494,940	B1	12/2002	Hak	
6,680,028	B1	1/2004	Harris	
6,955,708	B1	10/2005	Julos et al.	
8,212,146	B1	7/2012	Moore	
9,821,259	B2	11/2017	Bae et al.	
9,943,794	B2	4/2018	Jung	
9,950,289	B2	4/2018	Jung	
2002/0157415	A1	10/2002	Liu	
2004/0144249	A1	7/2004	Kang et al.	
2005/0066634	A1	3/2005	Genn et al.	
2006/0107834	A1	5/2006	Vandenbelt et al.	
2006/0201119	A1	9/2006	Song	
2006/0277875	A1	12/2006	Schuld	
2007/0137489	A1	6/2007	Luo	
2007/0221061	A1	9/2007	Steiner et al.	
2008/0286163	A1	11/2008	Garfield	
2010/0225012	A1	9/2010	Fitton et al.	
2010/0225015	A1	9/2010	Techlin et al.	
2011/0033346	A1	2/2011	Bohlen	
2011/0308210	A1	12/2011	Crabtree et al.	
2013/0055692	A1	3/2013	Cecchi et al.	
2013/0090052	A1	4/2013	Akhtar	
2014/0020561	A1	1/2014	Aery	
2014/0102664	A1	4/2014	Kim et al.	
2014/0216251	A1	8/2014	Jun et al.	
2014/0216259	A1	8/2014	Iwaki	
2015/0273376	A1	10/2015	Sohn et al.	
2015/0306533	A1	10/2015	Matlin et al.	
2015/0345816	A1	12/2015	Donovan	
2016/0032942	A1 *	2/2016	Jung	F04D 29/563 415/148
2016/0184753	A1	6/2016	Chu et al.	

FOREIGN PATENT DOCUMENTS

CN	1598413	3/2005
CN	1619229	5/2005
CN	1752617	3/2006
CN	2769724	4/2006
CN	1784258	6/2006
CN	101021345	8/2007
CN	101105307	1/2008
CN	201106913	8/2008
CN	201482362	5/2010
CN	102748817	10/2012
CN	202568987	12/2012
CN	103574770	2/2014
CN	103673076	3/2014
CN	103712318	4/2014
CN	103727632	4/2014
CN	203518040	4/2014
CN	103930730	7/2014
CN	103982994	8/2014
CN	203893332	10/2014
CN	203964288	11/2014
CN	102661295	12/2014
CN	204084651	1/2015
CN	104329785	2/2015
CN	204141826	2/2015
CN	104406235	3/2015
CN	104456772	3/2015
CN	104603545	5/2015
CN	204447560	7/2015
CN	104937359	9/2015
CN	104971567	10/2015
CN	104990155	10/2015
CN	105091106	11/2015
CN	105185242	12/2015
CN	105221452	1/2016
CN	204933080	1/2016
CN	204963008	1/2016
CN	105299862	2/2016
CN	105299863	2/2016
CN	105333499	2/2016
CN	105333528	2/2016
CN	206300285	7/2017
CN	206300287	7/2017
CN	206300288	7/2017
CN	206338921	7/2017
DE	9312051	10/1993
EP	1 950 500	7/2008
EP	2 072 920	6/2009
EP	2 476 968	7/2012
EP	2 837 897	2/2015
EP	2 853 835	4/2015
GB	995962	6/1965
GB	996962	6/1965
GB	2 345 005	6/2000
GB	2516058	1/2015
JP	H 04-103549	9/1992
JP	H 06-50180	6/1994
JP	7-208779	8/1995
JP	2000-354724	12/2000
JP	2006-022977	1/2006
JP	2007-105578	4/2007
JP	4526372	8/2010
JP	2012-120720	6/2012
JP	2013-217580	10/2013
JP	2014-507277	3/2014
JP	2014-119224	6/2014

(56) **References Cited**

FOREIGN PATENT DOCUMENTS

JP	2015-080737	4/2015
JP	2015-108497	6/2015
JP	5740503	6/2015
JP	2015-120138	7/2015
JP	5800652	10/2015
JP	2016-034602	3/2016
KR	20-1993-0002444	5/1993
KR	10-0139487	6/1998
KR	20-0173274	3/2000
KR	20-0289687	9/2002
KR	20-0342073	2/2004
KR	10-2004-0056151	6/2004
KR	10-2004-0108462	12/2004
KR	10-0508312	8/2005
KR	10-2005-0110233	11/2005
KR	10-2005-0115343	12/2005
KR	10-2006-0023457	3/2006
KR	10-2006-0026319	3/2006
KR	10-0674271	1/2007
KR	20-2008-0001777	6/2008
KR	10-2009-0058446	6/2009
KR	10-2009-0087652	8/2009
KR	10-2010-0056797	5/2010
KR	10-2010-0062121	6/2010
KR	10-2010-0070069	6/2010
KR	10-2010-0102507	9/2010
KR	10-2011-0029870	3/2011
KR	10-2012-0060279	6/2012
KR	10-2012-0071992	7/2012
KR	10-1168738	7/2012
KR	10-1203570	11/2012
KR	10-2012-0136137	12/2012
KR	10-2013-0036447	4/2013
KR	10-1278334	6/2013
KR	10-1342606	12/2013
KR	10-2014-0039703	4/2014
KR	10-1385290	4/2014
KR	10-2014-0092953	7/2014
KR	10-2014-0094414	7/2014
KR	10-2014-0096971	8/2014
KR	10-2015-0005594	1/2015
KR	10-1500501	3/2015
KR	10-1506653	3/2015
KR	10-1512664	4/2015
KR	10-1516365	5/2015
KR	10-2016-0012796	2/2016
KR	10-2016-0015084	2/2016
KR	10-2016-0017587	2/2016
KR	10-2016-0028292	3/2016
KR	10-1599634	3/2016
KR	10-2016-0048499	5/2016
KR	10-2016-0053649	5/2016
KR	10-2016-0104837	9/2016
WO	WO 2010/109944	9/2010
WO	WO 2013/121672	8/2013
WO	WO 2015/171571	11/2015

OTHER PUBLICATIONS

Korean Office Action dated Aug. 31, 2017 issued in Application No. 10-2016-0073063.
Korean Office Action dated Oct. 31, 2017.
International Search Report dated Mar. 20, 2017 issued in Application No. PCT/KR2016/013906.
United States Office Action dated Feb. 10, 2017 issued in co-pending U.S. Appl. No. 15/363,111.
Korean Office Action dated Jan. 26, 2017 issued in Application No. 10-2016-0073055.
Korean Office Action dated Jan. 26, 2017 issued in Application No. 10-2016-0073083.
Korean Office Action dated Jan. 26, 2017 issued in Application No. 10-2016-0077888.
International Search Report dated Mar. 21, 2017 issued in Application No. PCT/KR2016/013907.
Korean Office Action dated Apr. 12, 2018.
Korean Notice of Allowance dated Apr. 17, 2018.
Korean Notice of Allowance dated Jun. 11, 2018.
European Search Report dated Jan. 17, 2018.
European Search Report dated Jan. 18, 2018.
European Search Report dated Jun. 21, 2017 issued in Application No. 16201093.8.
Korean Office Action dated Jun. 21, 2017 issued in Application No. 10-2017-0056789.
Korean Office Action dated Jun. 21, 2017 issued in Application No. 10-2017-0056790.
Korean Office Action dated Jun. 21, 2017 issued in Application No. 10-2017-0056791.
European Search Report dated Jun. 23, 2017 issued in Application No. 16201089.6.
European Search Report dated Jun. 23, 2017 issued in Application No. 16201088.8.
Korean Office Action dated Jun. 30, 2017 issued in Application No. 10-2017-0056864.
European Search Report dated Jul. 14, 2017 issued in Application No. 16201094.6.
European Search Report dated Jul. 20, 2017 issued in Application No. 16201091.2.
Korean Notice of Allowance dated Aug. 15, 2017 issued in Application No. 10-2016-0074369.
Korean Office Action dated Aug. 22, 2017 issued in Application No. 10-2016-0073055.
United States Office Action dated Oct. 24, 2018 issued in co-pending related U.S. Appl. No. 15/363,643.
United States Office Action dated Oct. 25, 2018 issued in co-pending related U.S. Appl. No. 15/441,957.
European Search Report dated Jul. 20, 2017 issued in Application No. 16201090.4.
Korean Office Action dated Aug. 31, 2017 issued in Application No. 10-2016-0073090.
U.S. Office Action issued in U.S. Appl. No. 15/364,369 dated Jul. 14, 2017.
European Search Report dated Apr. 25, 2017 issued in Application No. 16201086.2-1602.
European Search Report dated Apr. 25, 2017 issued in Application No. 17157045.0-1602.
Korean Office Action dated Jun. 21, 2017 (10-2017-0056865).
Korean Office Action dated Jun. 21, 2017 (10-2017-0056885).
Korean Office Action dated Jun. 21, 2017 (10-2017-0056886).
United States Office Action dated Nov. 8, 2018 issued in co-pending related U.S. Appl. No. 15/363,438.
Chinese Office Action dated Feb. 22, 2019 with English Translation.
U.S. Office Action issued in U.S. Appl. No. 15/660,076 dated May 8, 2019.
Chinese Office Action dated Jan. 11, 2019 issued in Application No. 201611089233.9 (with English Translation).
United States Office Action dated Mar. 1, 2019 issued in co-pending related U.S. Appl. No. 15/363,438.
Chinese Office Action dated Mar. 5, 2019 issued in Application No. 201611089126.6 (with English Translation).
Chinese Office Action dated Mar. 27, 2019 issued in Application No. 201611089196.1 (with English Translation).
Korean Office Action dated May 2, 2019 issued in Application No. 10-2019-0025204.
Chinese Office Action dated Feb. 28, 2019 issued in Application No. 201611087595.4 (with English Translation).
Chinese Office Action dated Feb. 28, 2019 issued in Application No. 201611089358.1 (with English Translation).
U.S. Appl. No. 15/441,957, filed Feb. 24, 2017.
United States Office Action dated Feb. 6, 2019 issued in co-pending related U.S. Appl. No. 15/660,105.
United States Office Action dated Feb. 6, 2019 issued in co-pending related U.S. Appl. No. 15/660,122.
United States Office Action dated Feb. 21, 2019 issued in co-pending related U.S. Appl. No. 15/659,878.
U.S. Office Action issued in U.S. Appl. No. 15/660,462 dated Jul. 19, 2019.

(56) **References Cited**

OTHER PUBLICATIONS

U.S. Office Action issued in U.S. Appl. No. 15/660,207 dated Jul. 22, 2019.
U.S. Appl. No. 15/363,111, filed Nov. 29, 2016.
U.S. Appl. No. 15/363,156, filed Nov. 29, 2016.
U.S. Appl. No. 15/363,204, filed Nov. 29, 2016.
U.S. Appl. No. 15/364,467, filed Nov. 30, 2016.
U.S. Appl. No. 15/364,369, filed Nov. 30, 2016.
U.S. Appl. No. 15/364,410, filed Nov. 30, 2016.
United States Office Action dated Jan. 20, 2017 issued in U.S. Appl. No. 15/363,156.
United States Office Action dated Jan. 20, 2017 issued in U.S. Appl. No. 15/364,369.
United States Office Action dated Jan. 23, 2017 issued in U.S. Appl. No. 15/363,204.
United States Office Action dated Jan. 23, 2017 issued in U.S. Appl. No. 15/364,410.
United States Office Action dated Jan. 23, 2017 issued in U.S. Appl. No. 15/364,467.
International Search Report dated Mar. 30, 2017 issued in Application No. PCT/KR2016/013912.
International Search Report dated Mar. 30, 2017 issued in Application No. PCT/KR2016/013908.
Korean Office Action dated Apr. 20, 2017 issued in Application No. 10-2016-0132790.
European Search Report dated Jun. 21, 2017 issued in Application No. 16201095.3.
U.S. Appl. No. 15/926,129, filed Mar. 20, 2018.
U.S. Appl. No. 15/659,869, filed Jul. 26, 2017.
U.S. Appl. No. 15/659,878, filed Jul. 26, 2017.
U.S. Appl. No. 15/660,105, filed Jul. 26, 2017.
U.S. Appl. No. 15/660,122, filed Jul. 26, 2017.
U.S. Appl. No. 15/363,438, filed Nov. 29, 2016.
U.S. Appl. No. 15/659,989, filed Jul. 26, 2017.
U.S. Appl. No. 15/660,076, filed Jul. 26, 2017.
U.S. Appl. No. 15/660,207, filed Jul. 26, 2017.
U.S. Appl. No. 15/660,287, filed Jul. 26, 2017.
U.S. Appl. No. 15/660,362, filed Jul. 26, 2017.
U.S. Appl. No. 15/660,462, filed Jul. 26, 2017.
U.S. Appl. No. 15/363,643, filed Nov. 29, 2016.
U.S. Appl. No. 16/409,017, filed May 10, 2019.
U.S. Office Action issued in U.S. Appl. No. 15/660,287 dated Aug. 16, 2019.
United States Office Action dated Aug. 22, 2019 issued in co-pending related U.S. Appl. No. 15/926,129.
Chinese Office Action dated May 24, 2019 issued in Application No. 201710637948.1 with English Translation.
Chinese Office Action dated Jun. 4, 2019 issued in Application No. 201710638173.X with English Translation.
Chinese Office Action dated Jun. 24, 2019 issued in Application No. 201710637920.8 with English Translation.
Chinese Office Action dated Jun. 26, 2019 issued in Application No. 201710790121.4 with English Translation.
Chinese Office Action dated Jun. 27, 2019 issued in Application No. 201710637967.4 with English Translation.
Chinese Office Action dated Jul. 16, 2019 issued in Application No. 201710638026.2. With English Translation.
Korean Notice of Allowance dated Jul. 1, 2019 issued in Application No. 10-2019-0063475.
Chinese Office Action dated Jun. 10, 2019 issued in Application No. 201710660027.7.
Chinese Office Action dated Jul. 29, 2019 issued in Application No. 201710659929.9.
Korean Office Action dated Jul. 22, 2019 issued in KR Application No. 10-2019-0060135.

* cited by examiner

Fig. 1

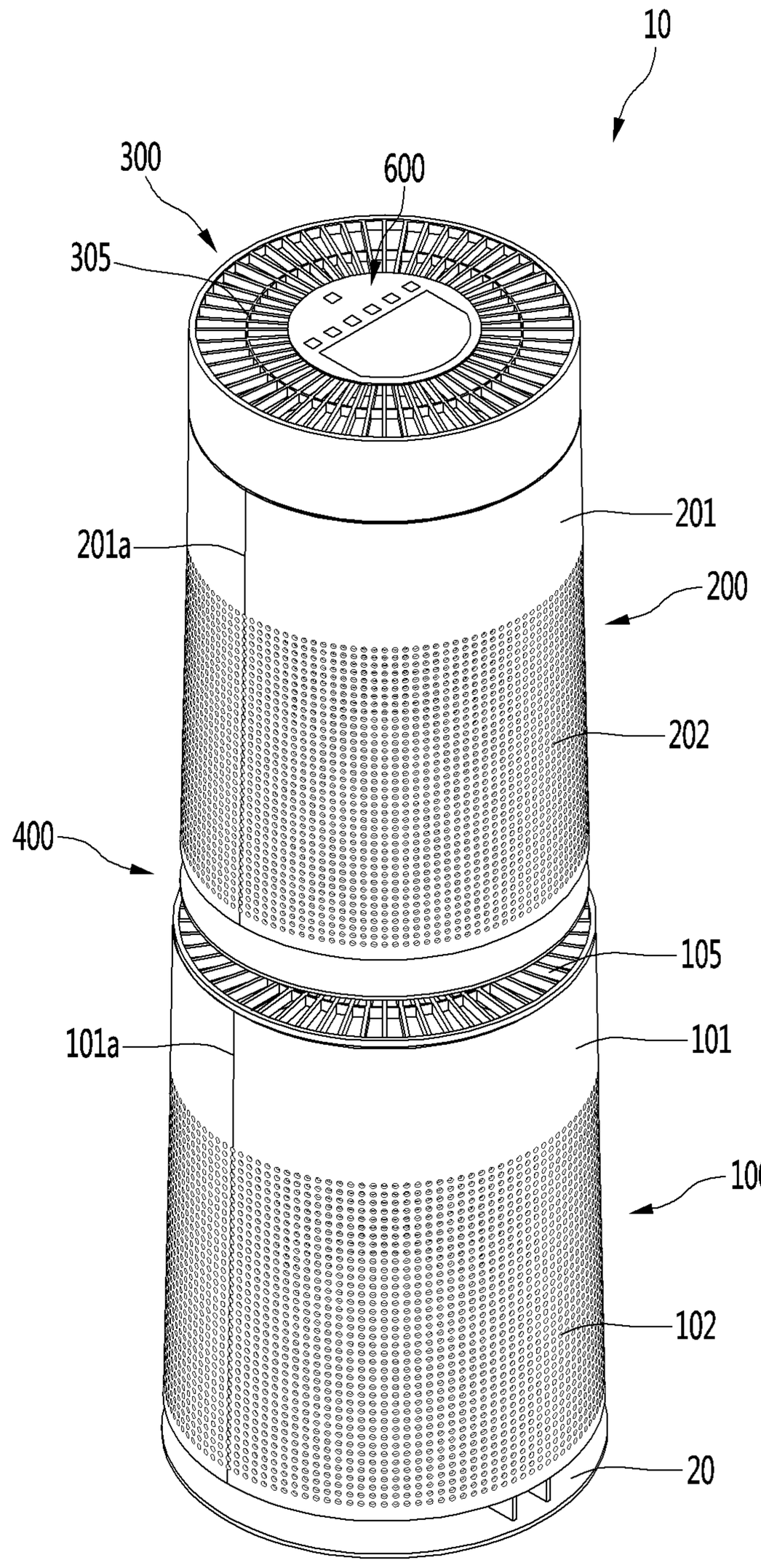


Fig. 2

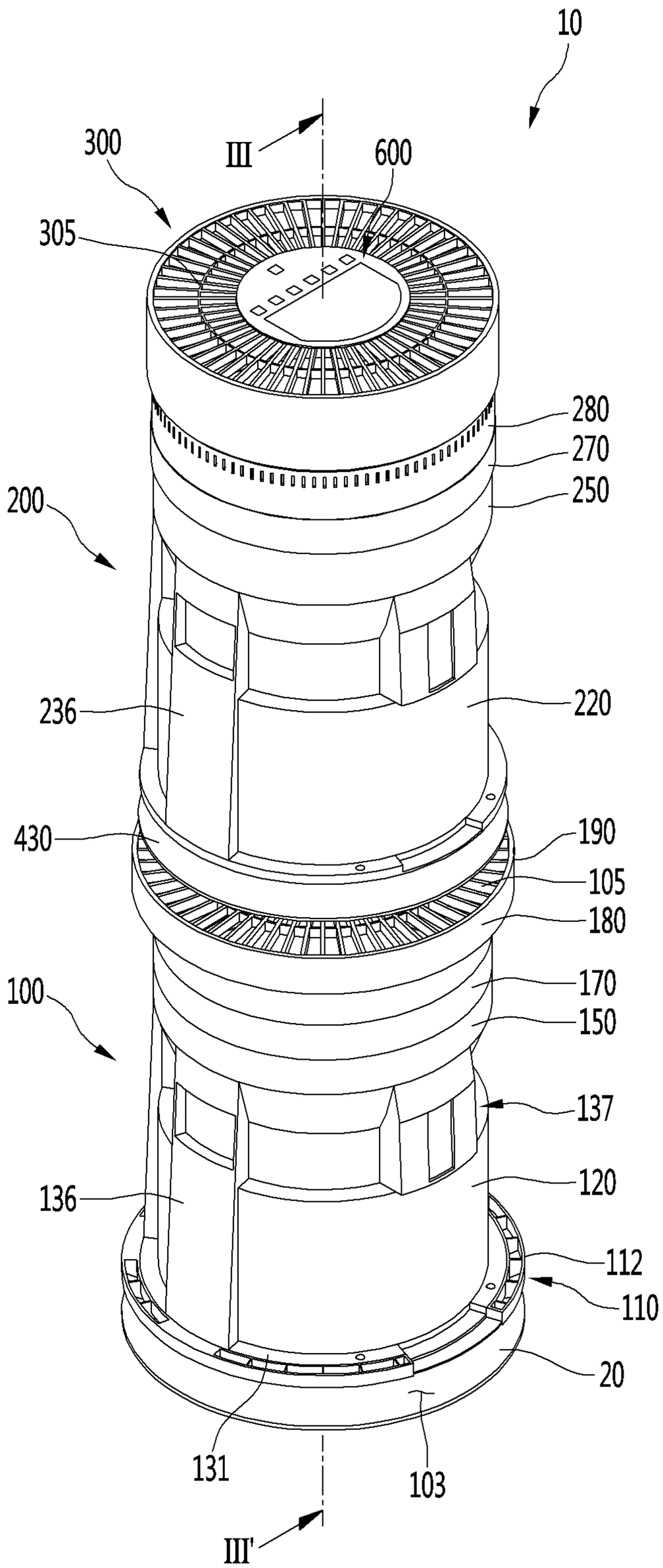

10
300
III
600
305
280
270
250
200
236
220
430
190
105
180
100
170
150
137
120
136
112
110
20
131
103
III'

Fig. 3

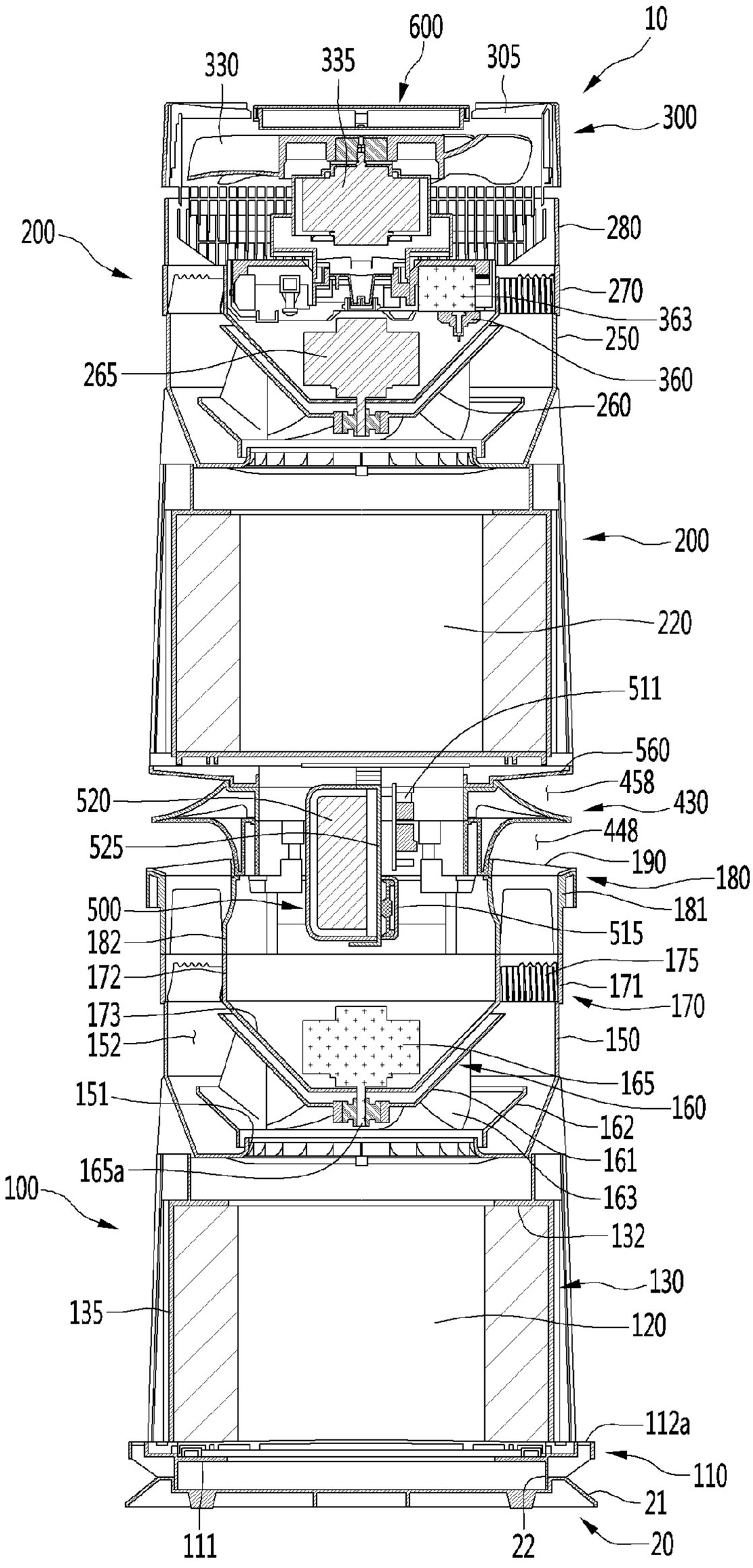

600
10
330
335
305
300
200
280
270
363
250
265
360
260
200
220
511
560
458
520
430
448
525
190
180
500
181
515
182
175
172
171
170
173
150
152
165
151
160
162
161
165a
163
100
132
130
135
120
112a
110
21
111
22
20

Fig. 4

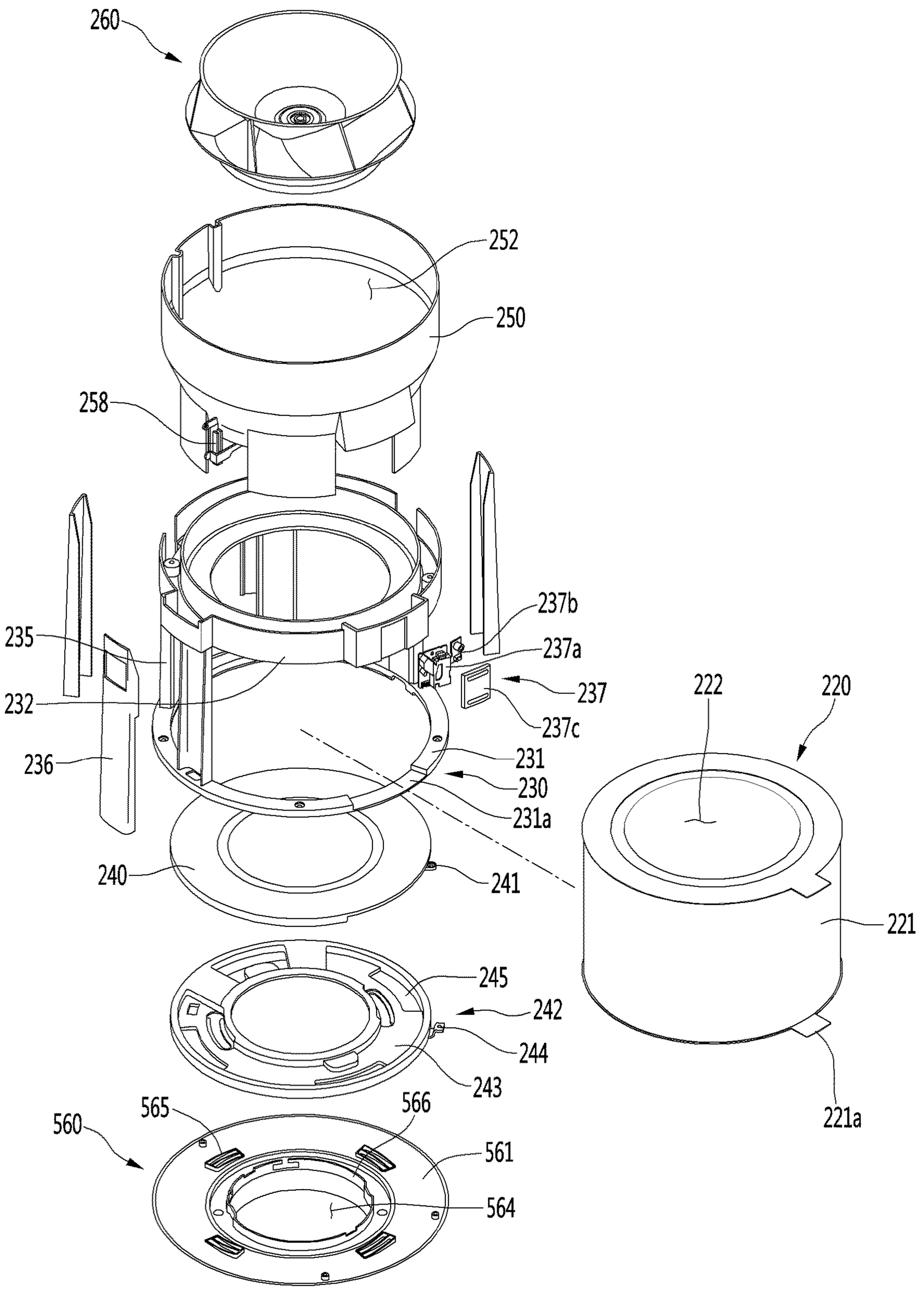

260
252
250
258
237b
237a
235
237
232
222
220
236
231
230
231a
240
241
221
245
242
244
243
221a
565
566
560
561
564

Fig. 5

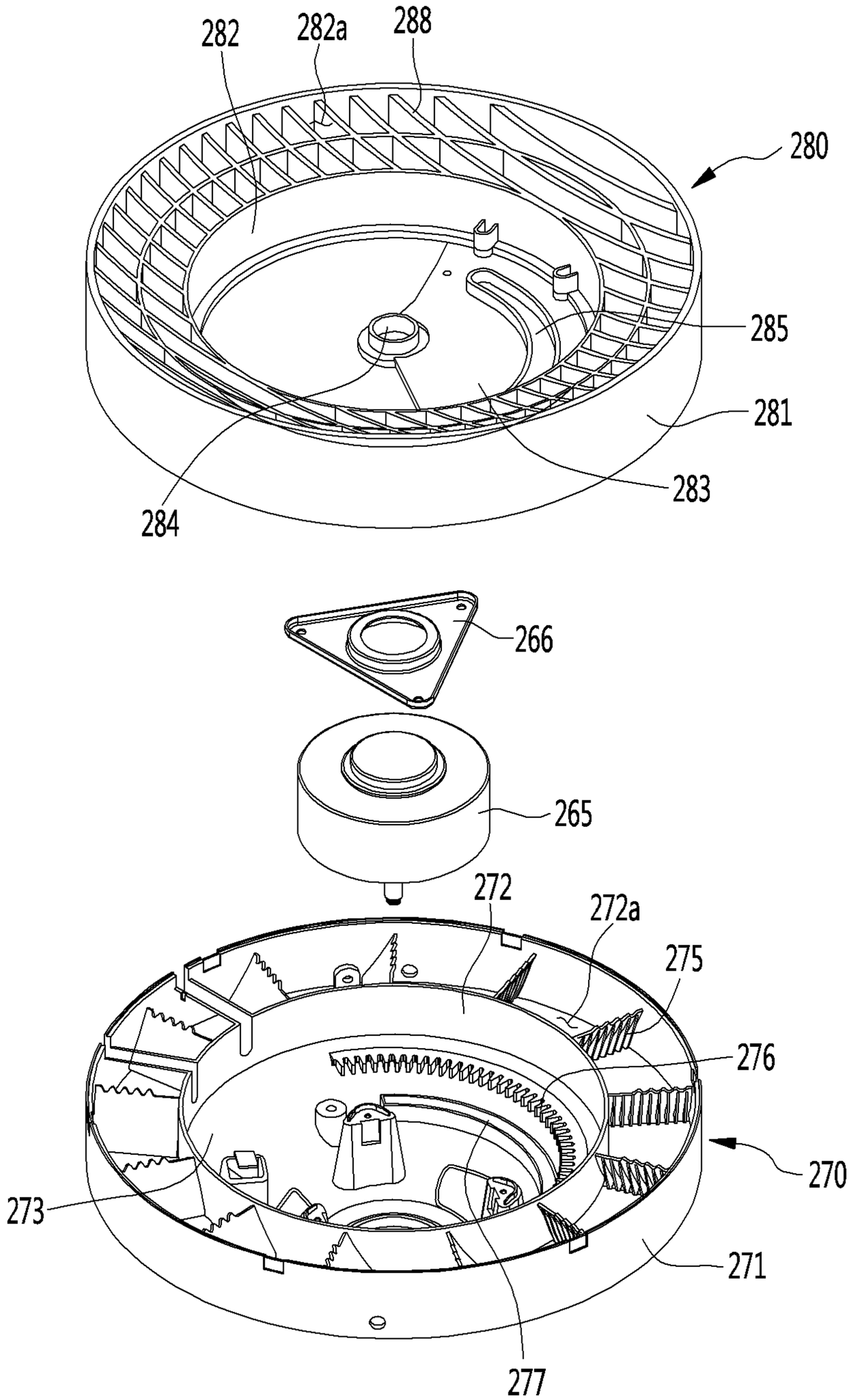

282
282a
288
280
285
281
283
284
266
265
272
272a
275
276
270
273
271
277

Fig. 6

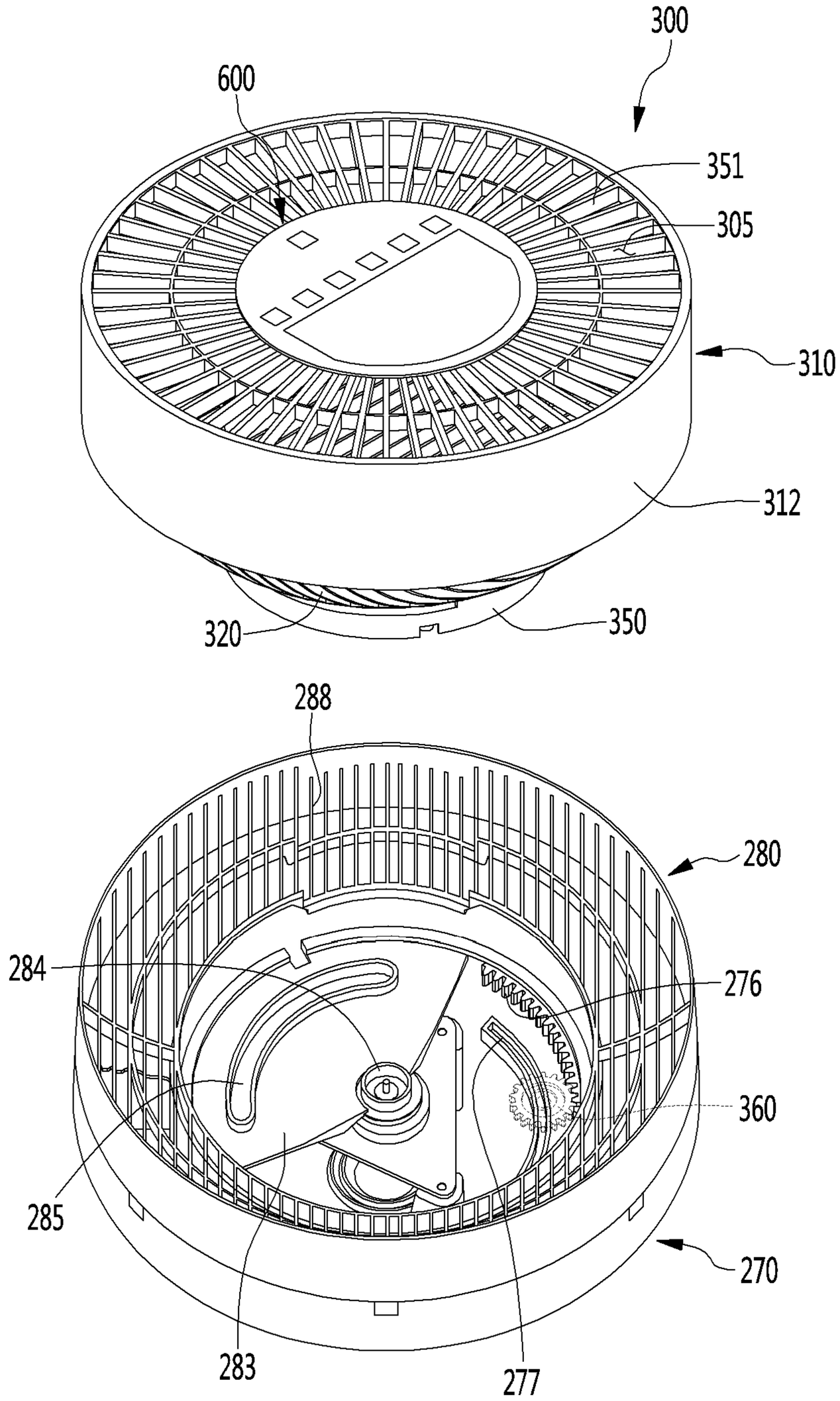

300
600
351
305
310
312
320
350
288
280
284
276
360
285
270
283
277

Fig. 7

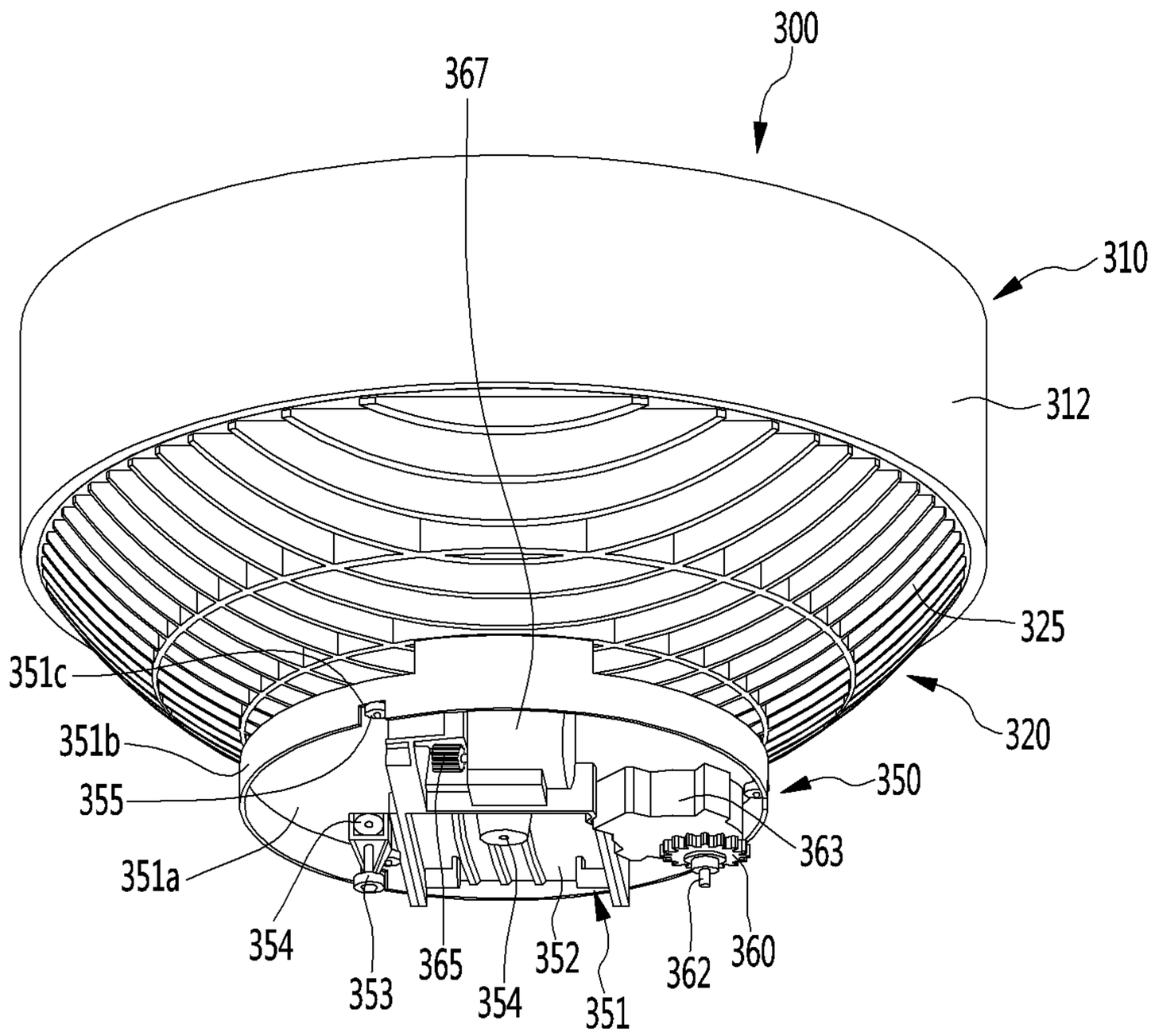

300
367
310
312
325
320
351c
351b
355
350
351a
363
354
353
365
354
352
351
362
360

Fig. 8

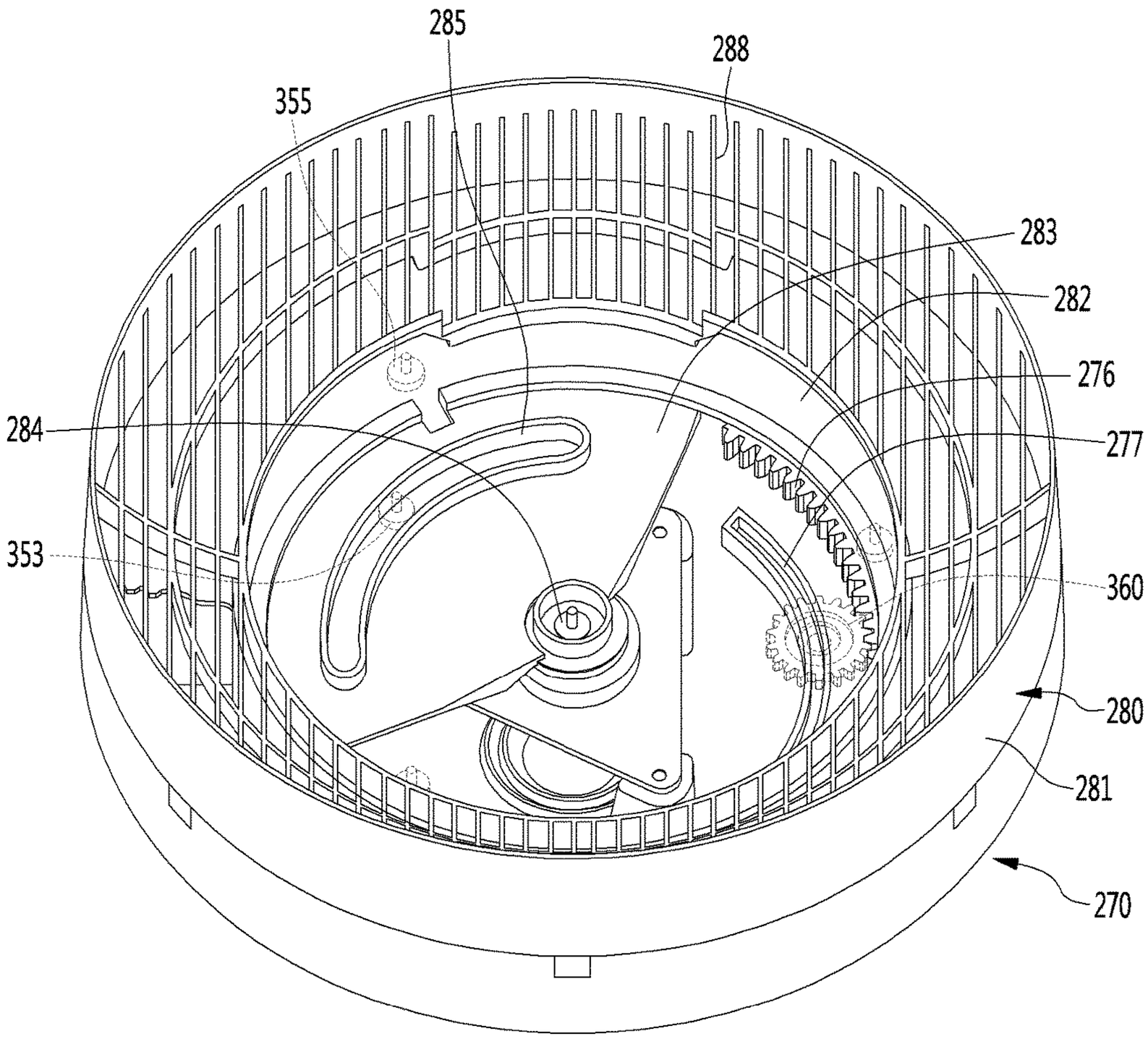


Fig. 9

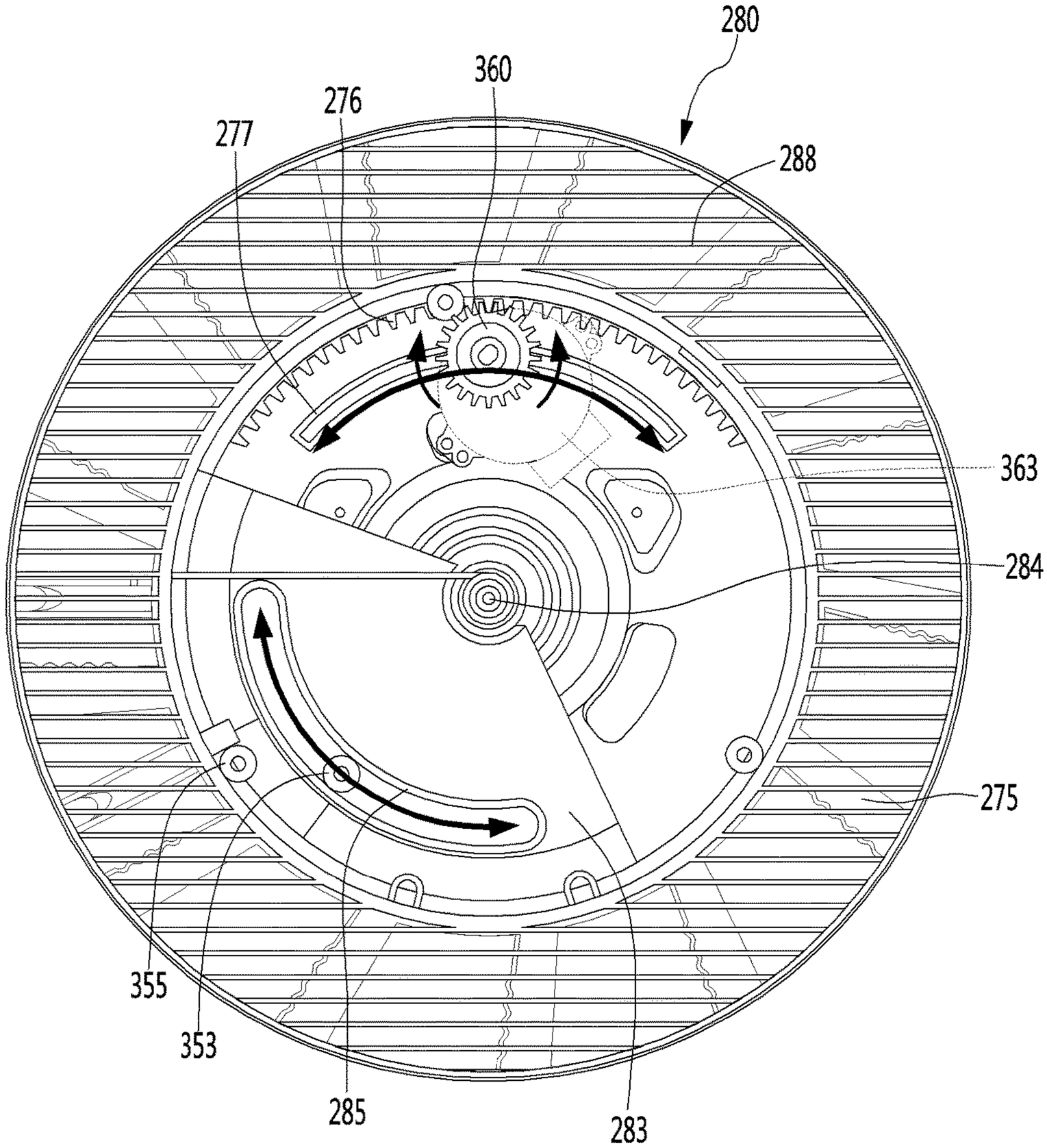


Fig. 10

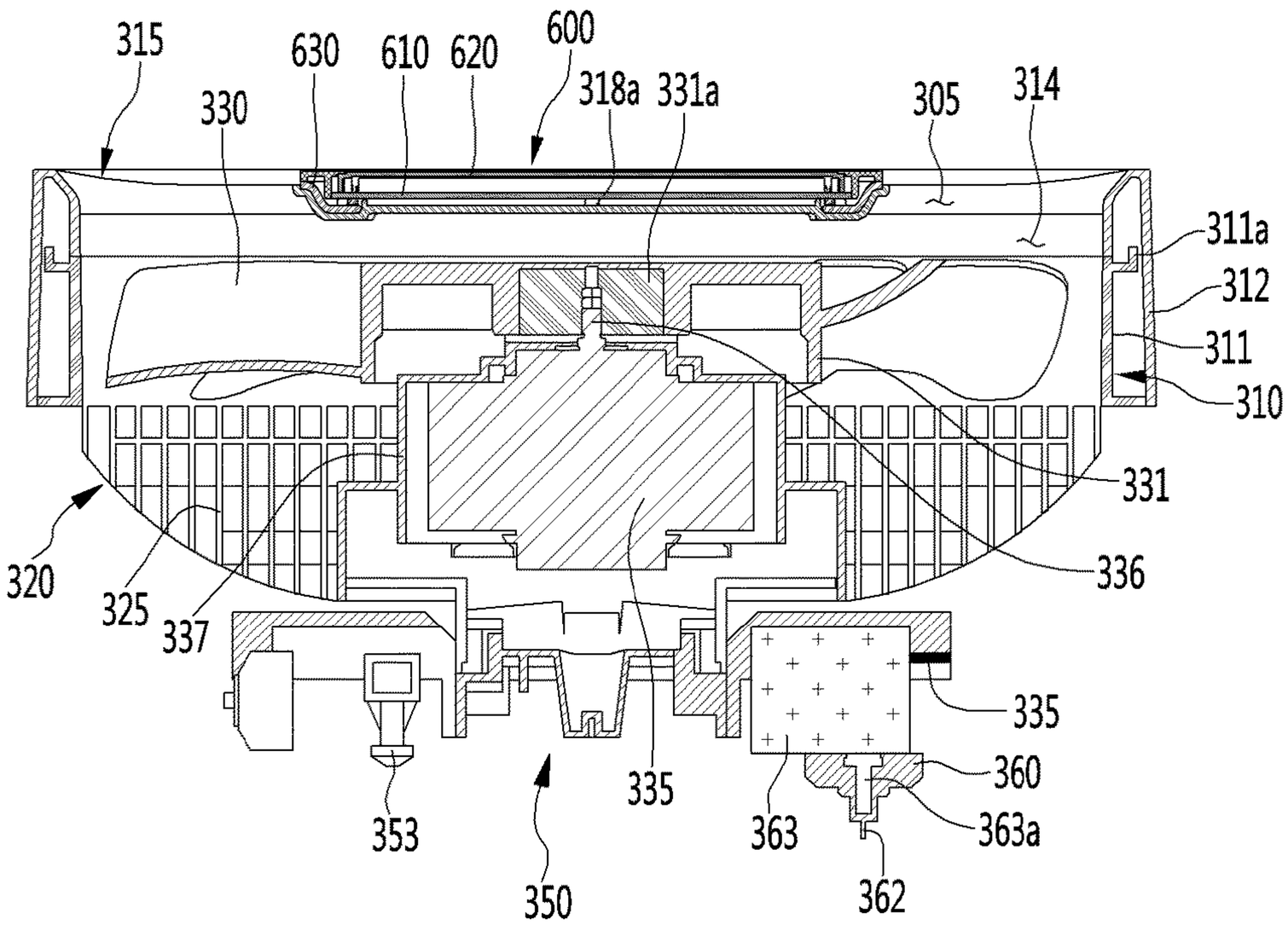

315
630
610
620
600
318a
331a
330
305
314
311a
312
311
310
331
336
320
325
337
335
335
360
363a
353
350
363
362

Fig. 11

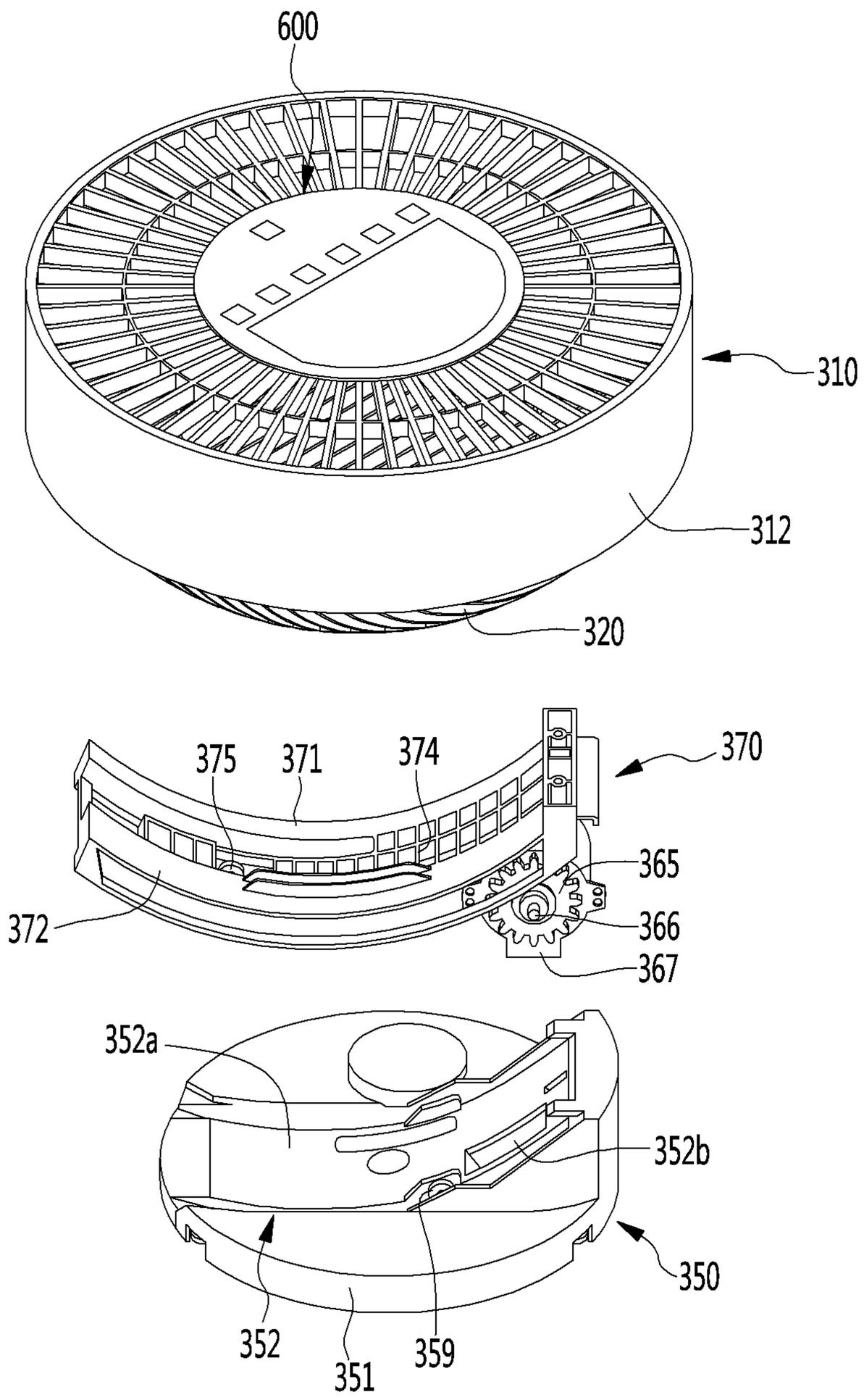

600
310
312
320
370
375
371
374
365
372
366
367
352a
352b
350
352
351
359

Fig. 12

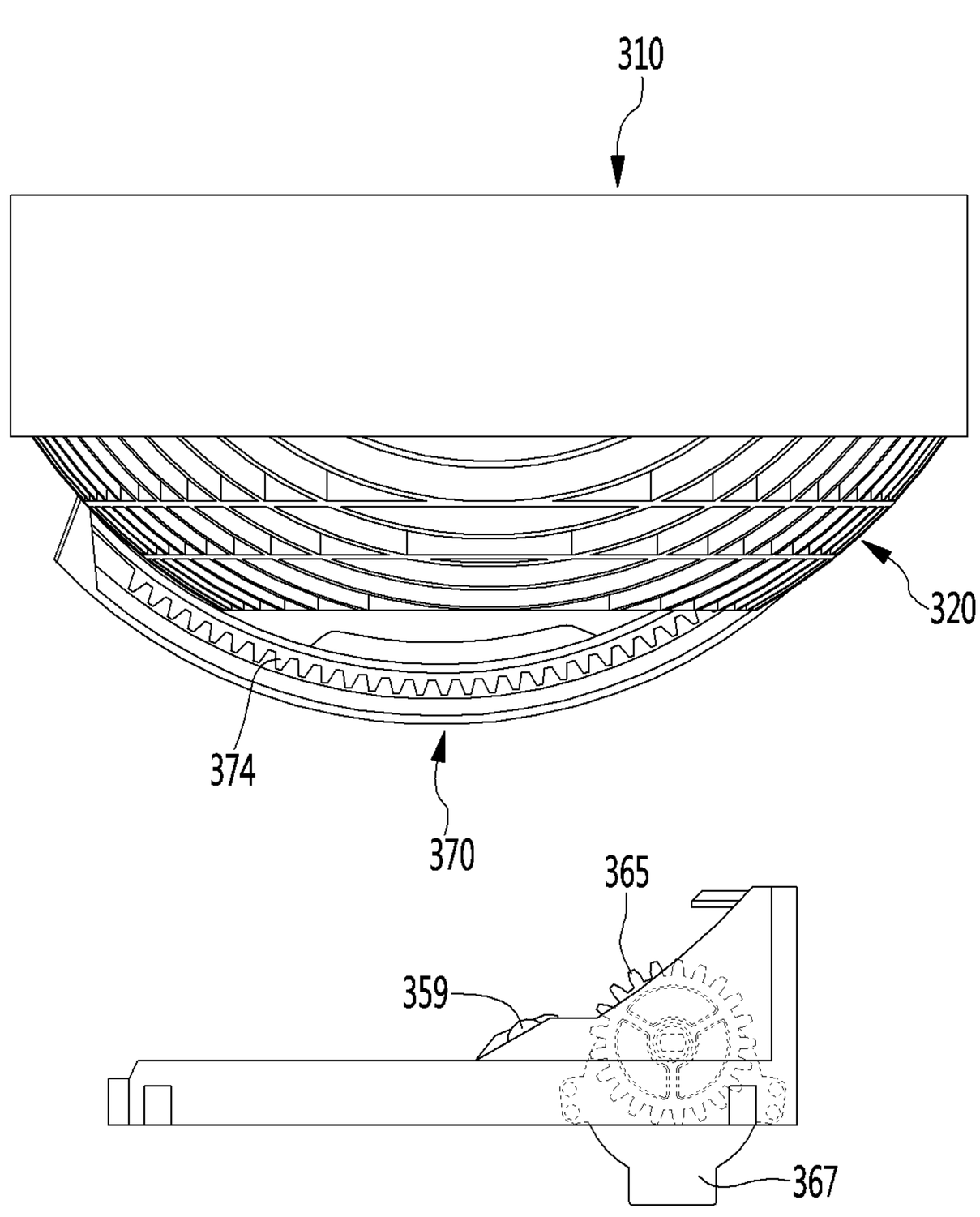


Fig. 13

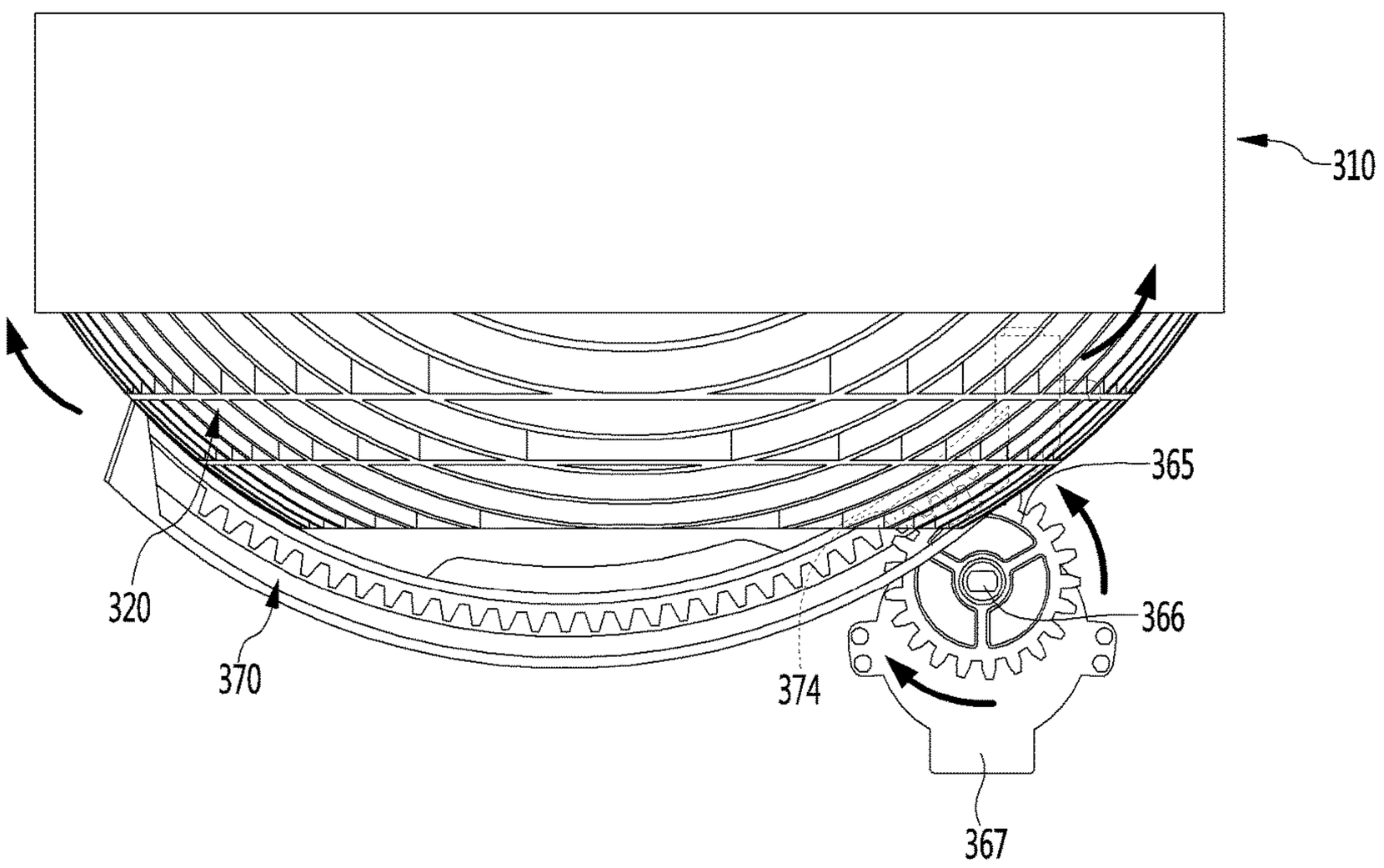


Fig. 14

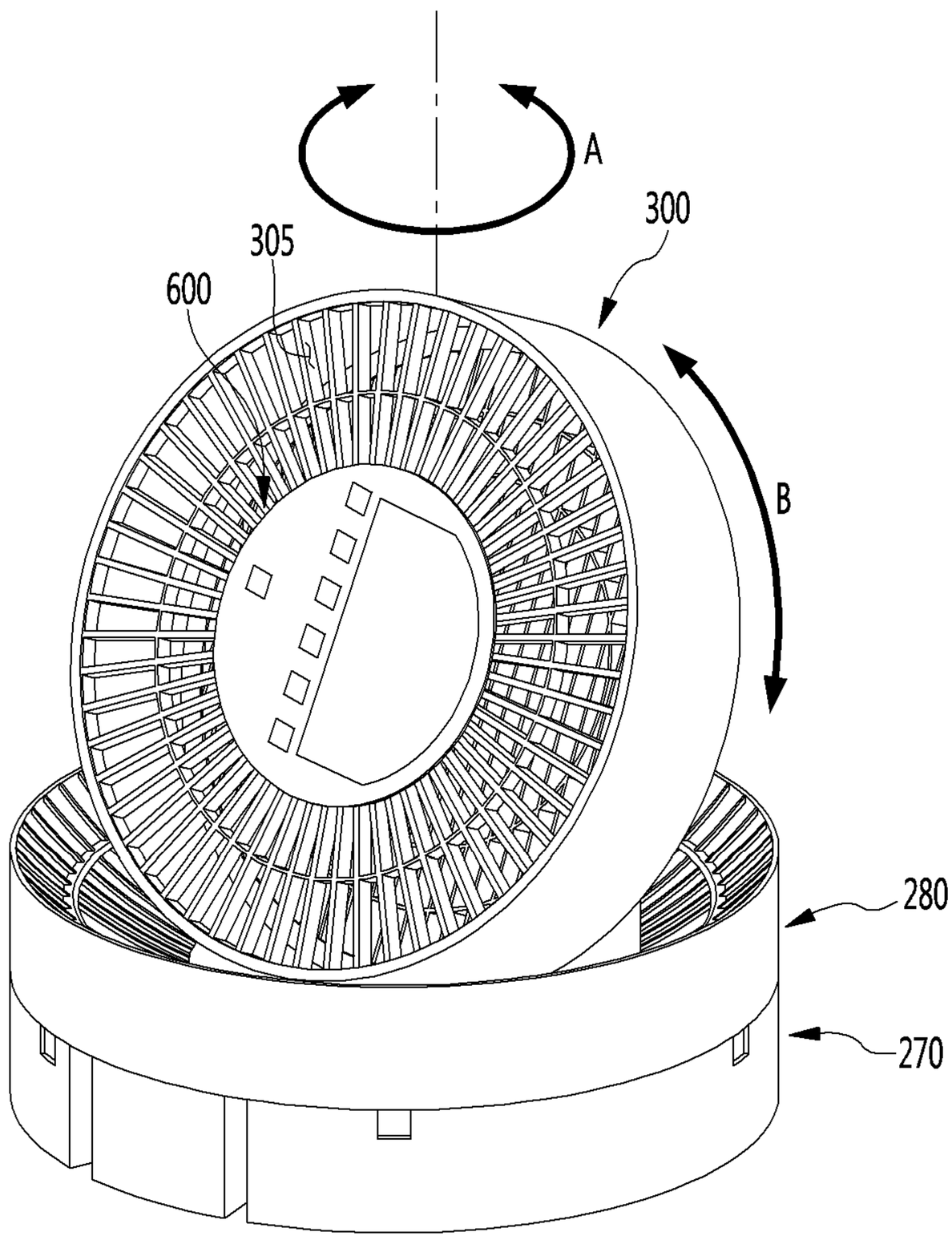


Fig. 15

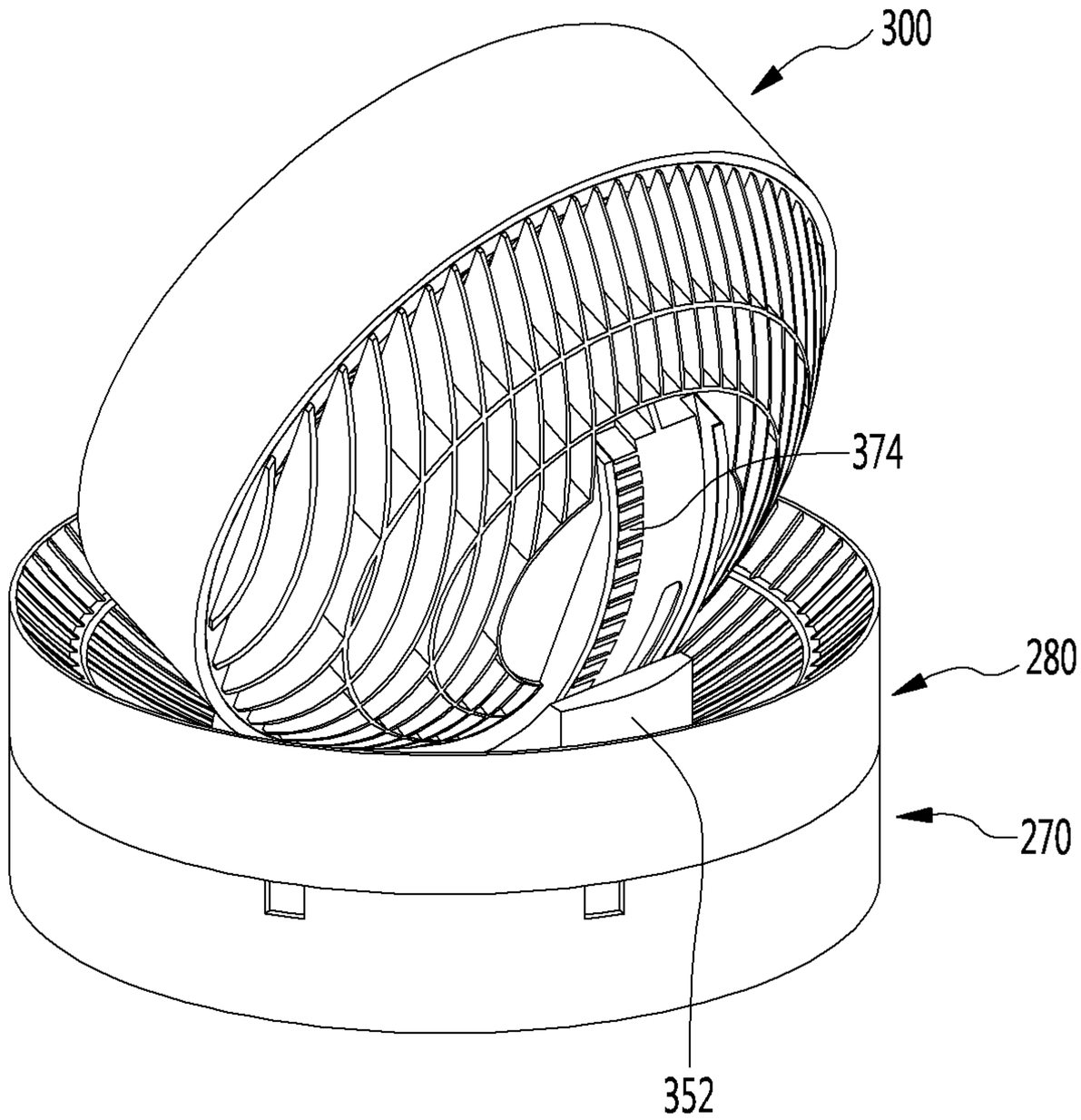


Fig. 16

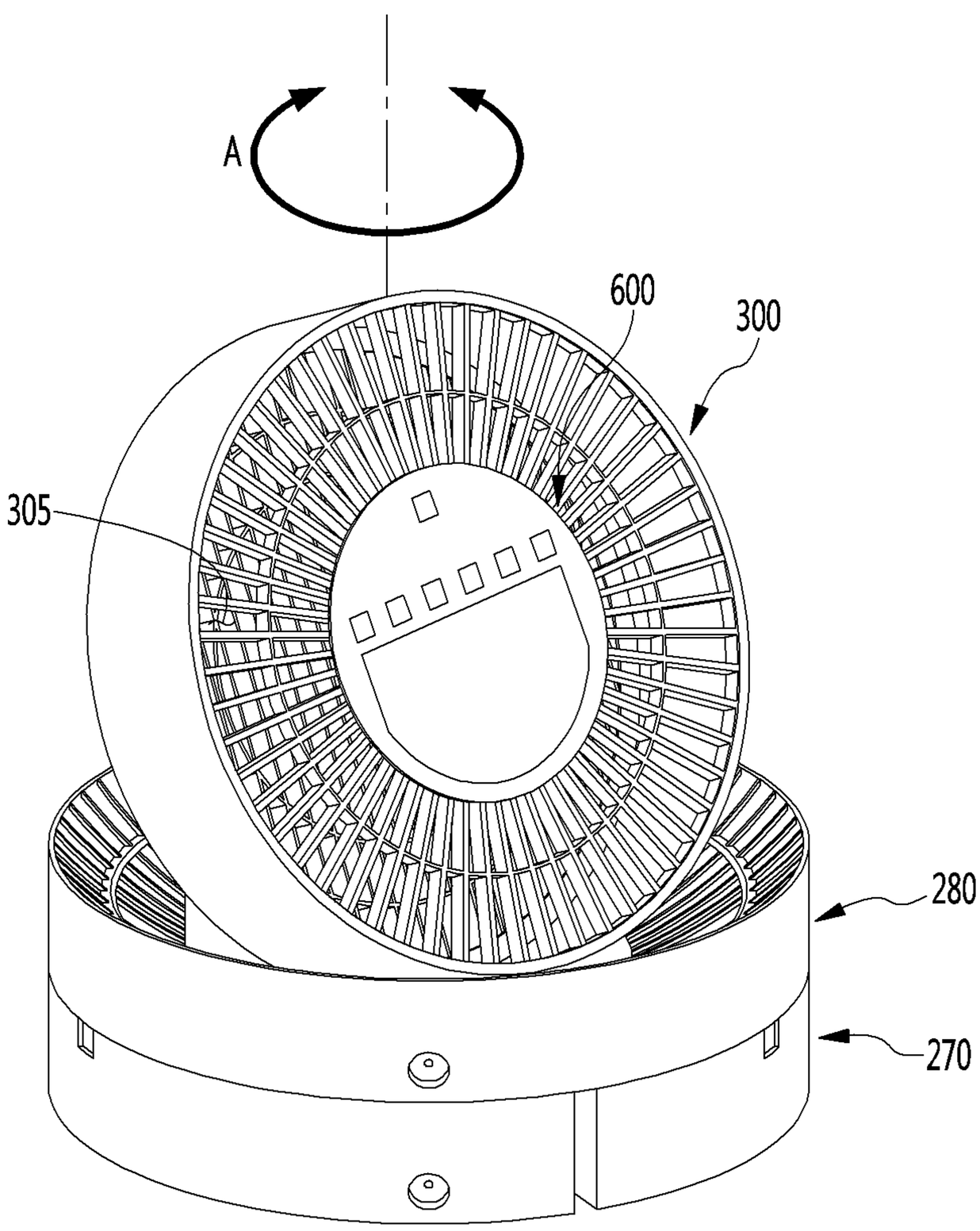


Fig. 17

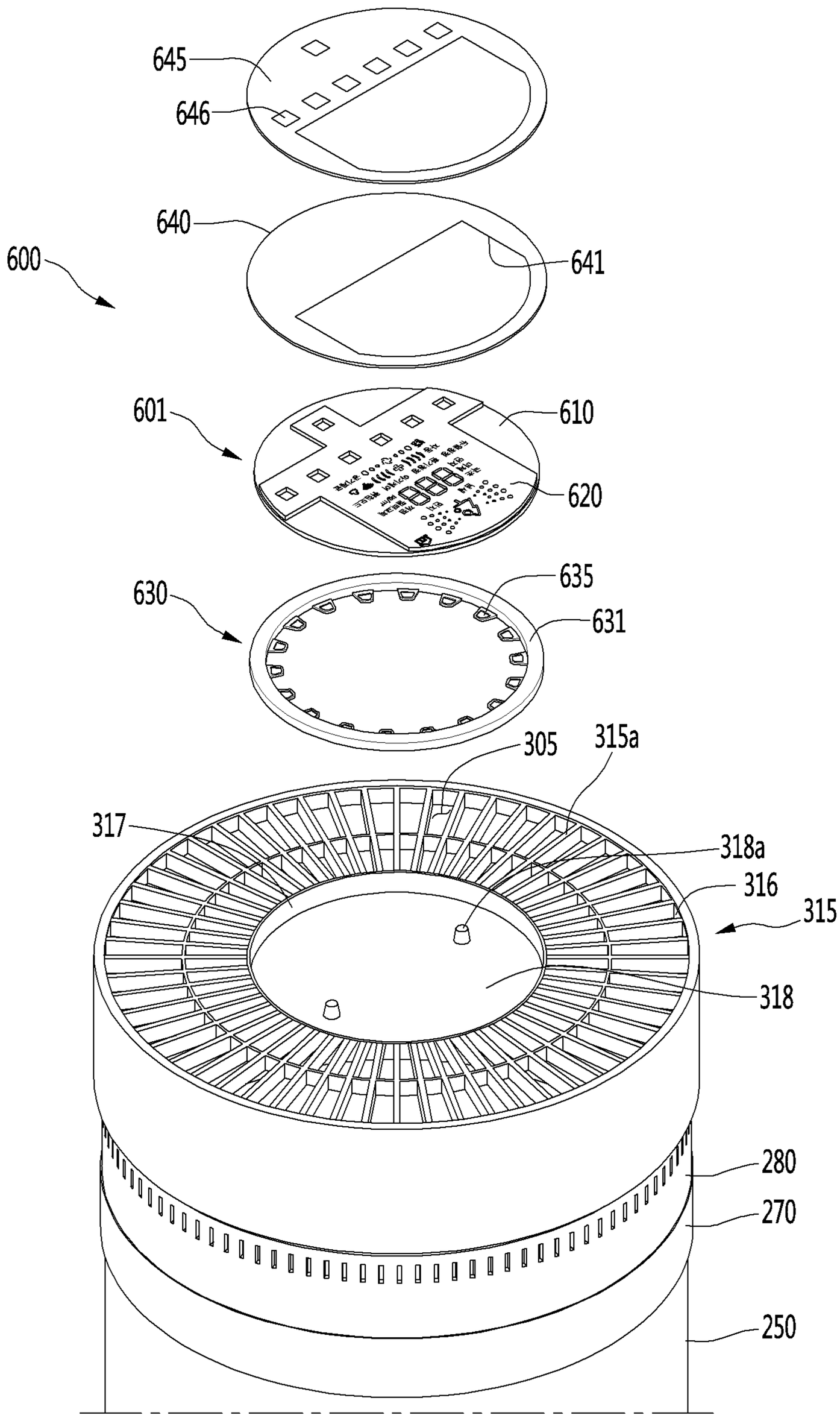

645
646
640
641
600
601
610
620
630
635
631
305
315a
317
318a
316
315
318
280
270
250

Fig. 18

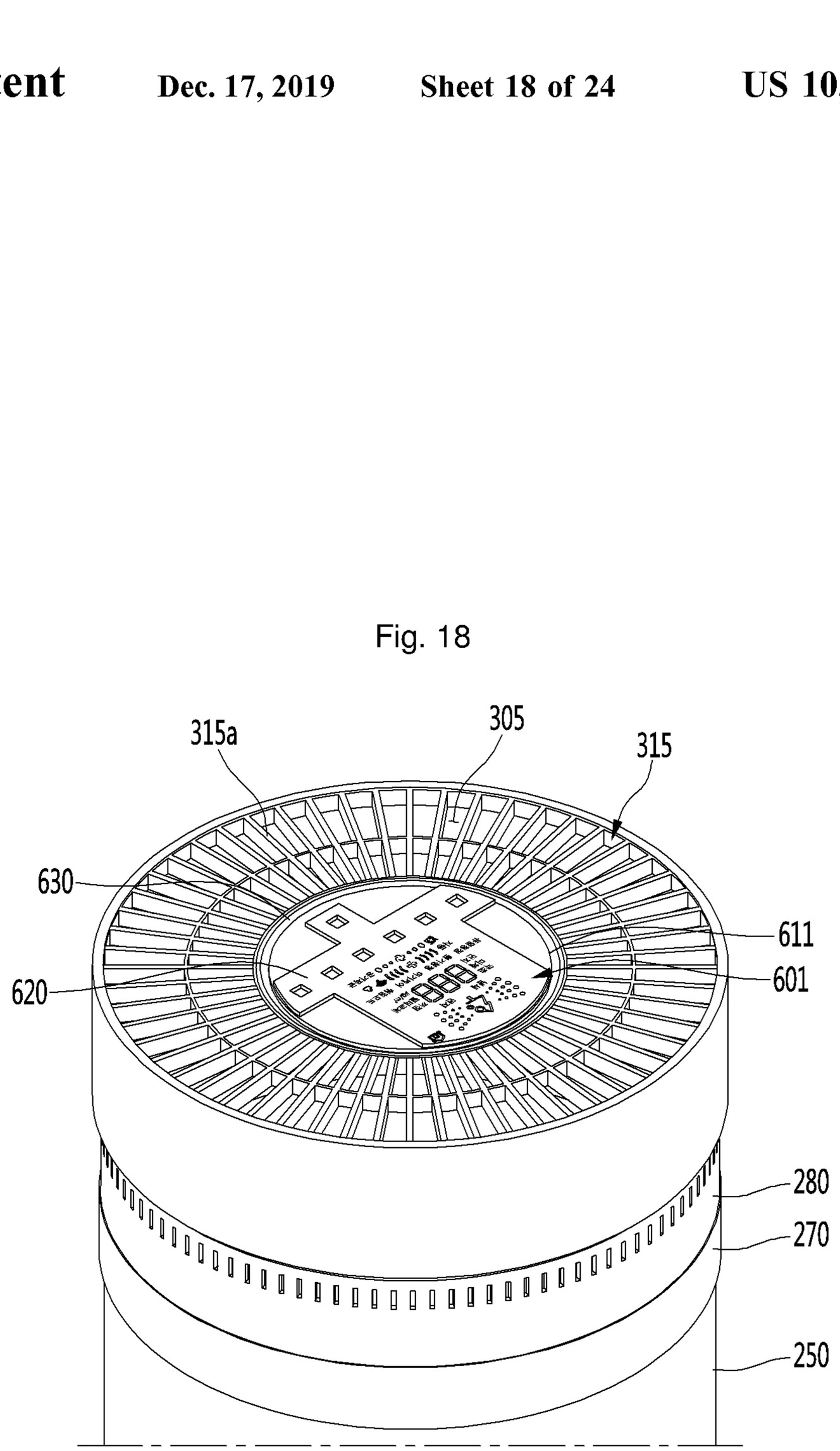


Fig. 19

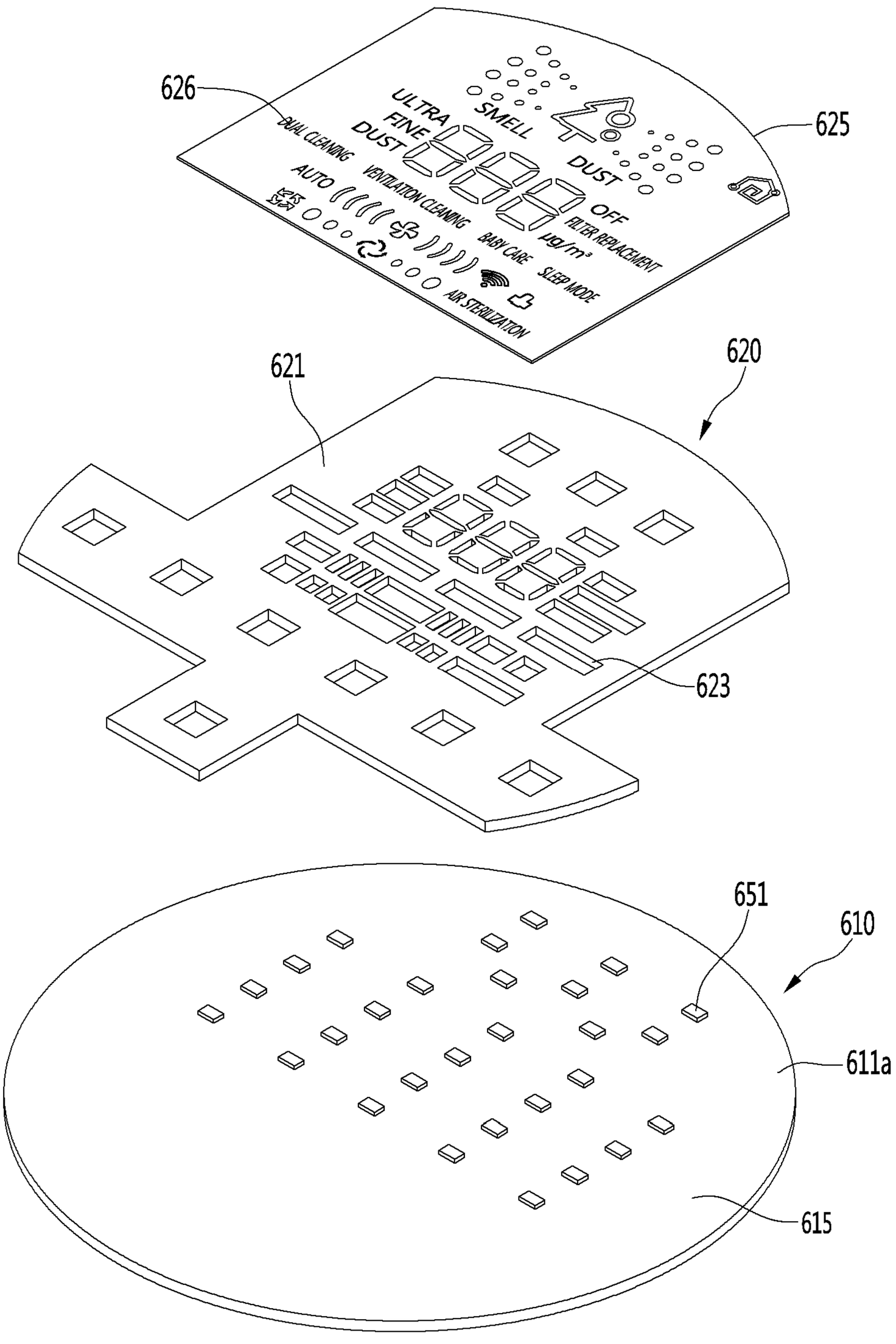

626
625
ULTRA FINE DUST
SMELL
DUST
DUAL CLEANING
VENTILATION CLEANING
BABY CARE
SLEEP MODE
AUTO
AIR STERILIZATION
OFF
FILTER REPLACEMENT
μg/m³
621
620
623
651
610
611a
615

Fig. 20

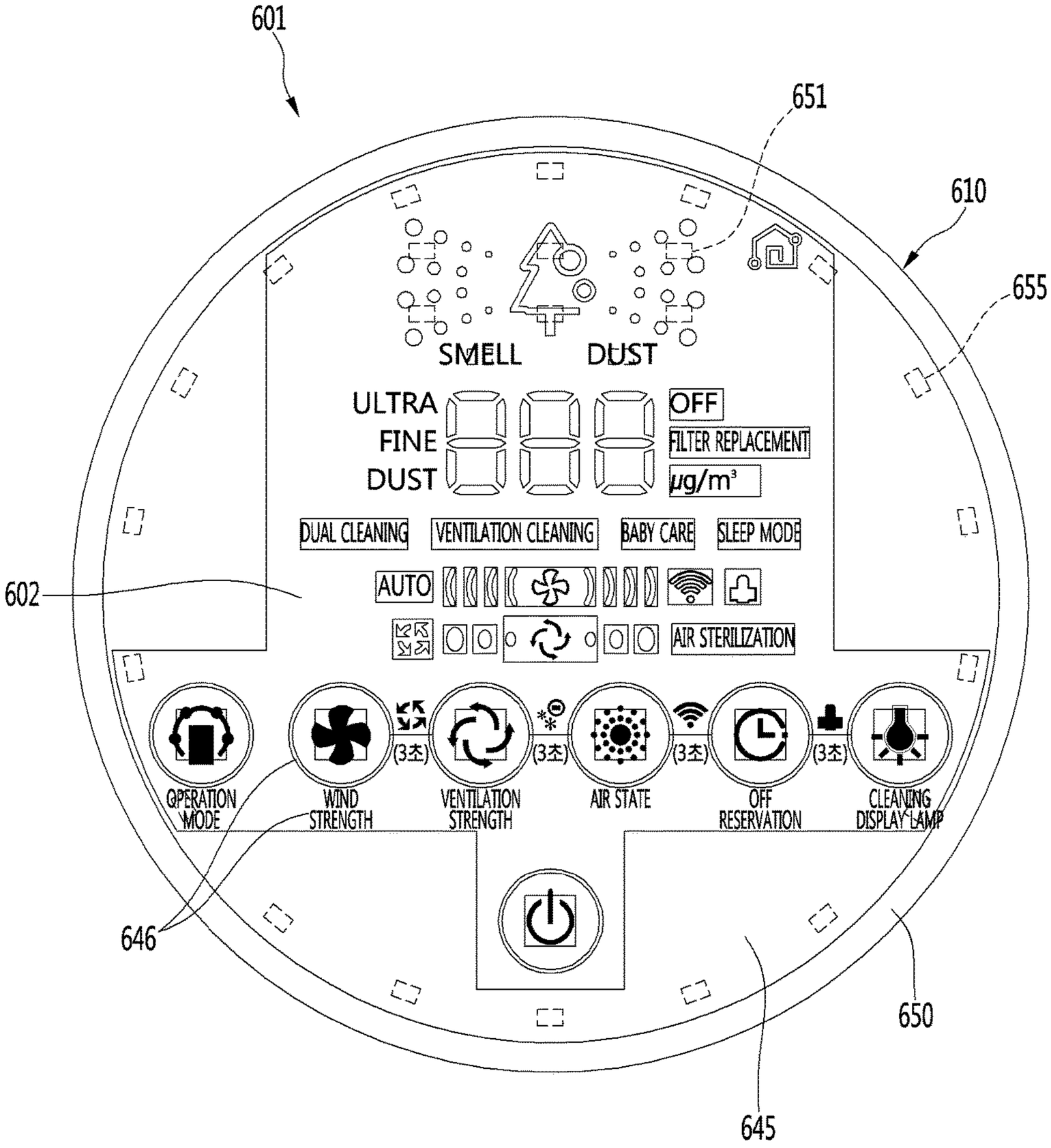

601
651
610
655
SMELL
DUST
ULTRA
FINE
DUST
OFF
FILTER REPLACEMENT
μg/m³
DUAL CLEANING
VENTILATION CLEANING
BABY CARE
SLEEP MODE
602
AUTO
AIR STERILIZATION
(3초)
(3초)
(3초)
(3초)
OPERATION MODE
WIND STRENGTH
VENTILATION STRENGTH
AIR STATE
OFF RESERVATION
CLEANING DISPLAY LAMP
646
650
645

Fig. 21

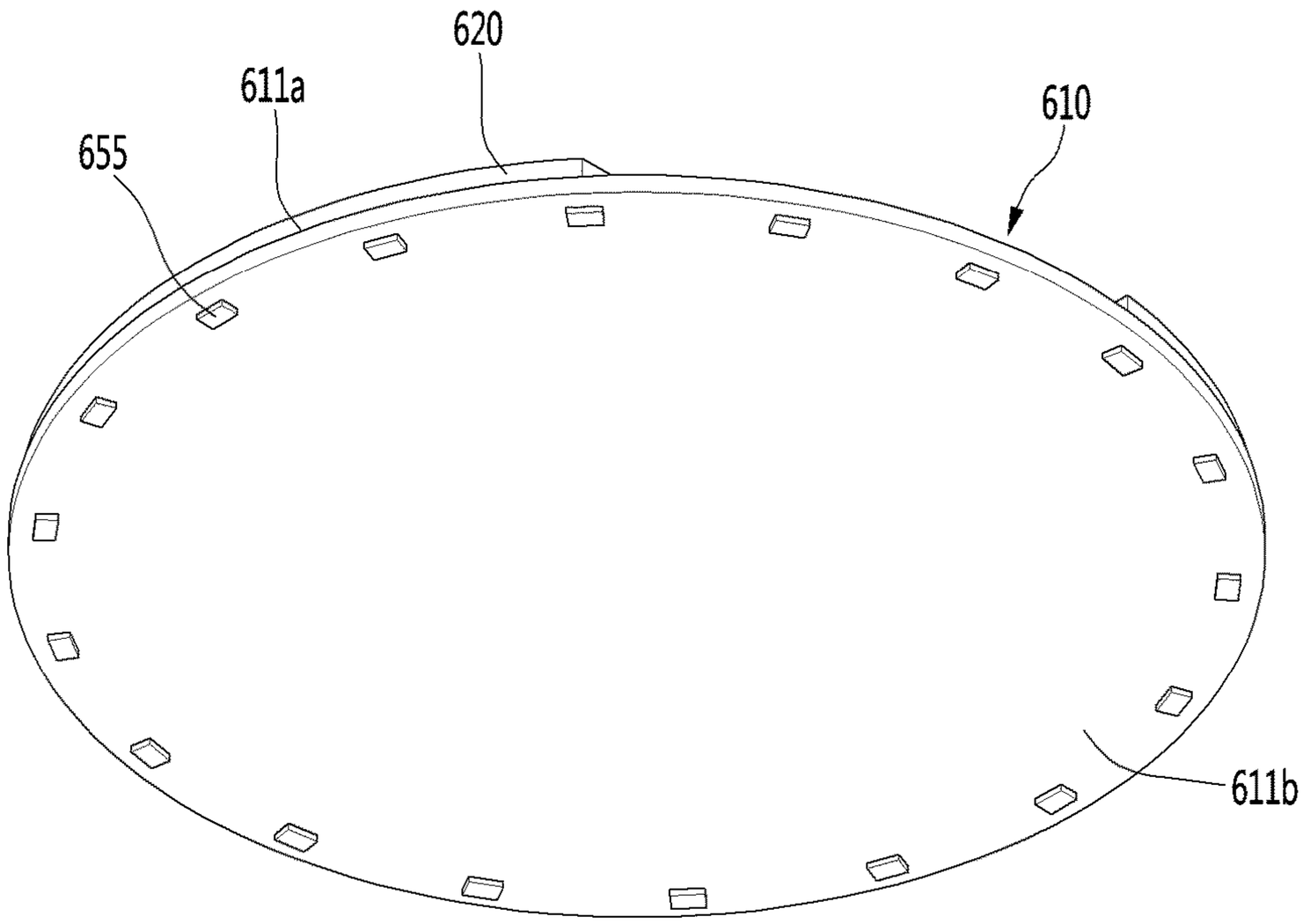


Fig. 22

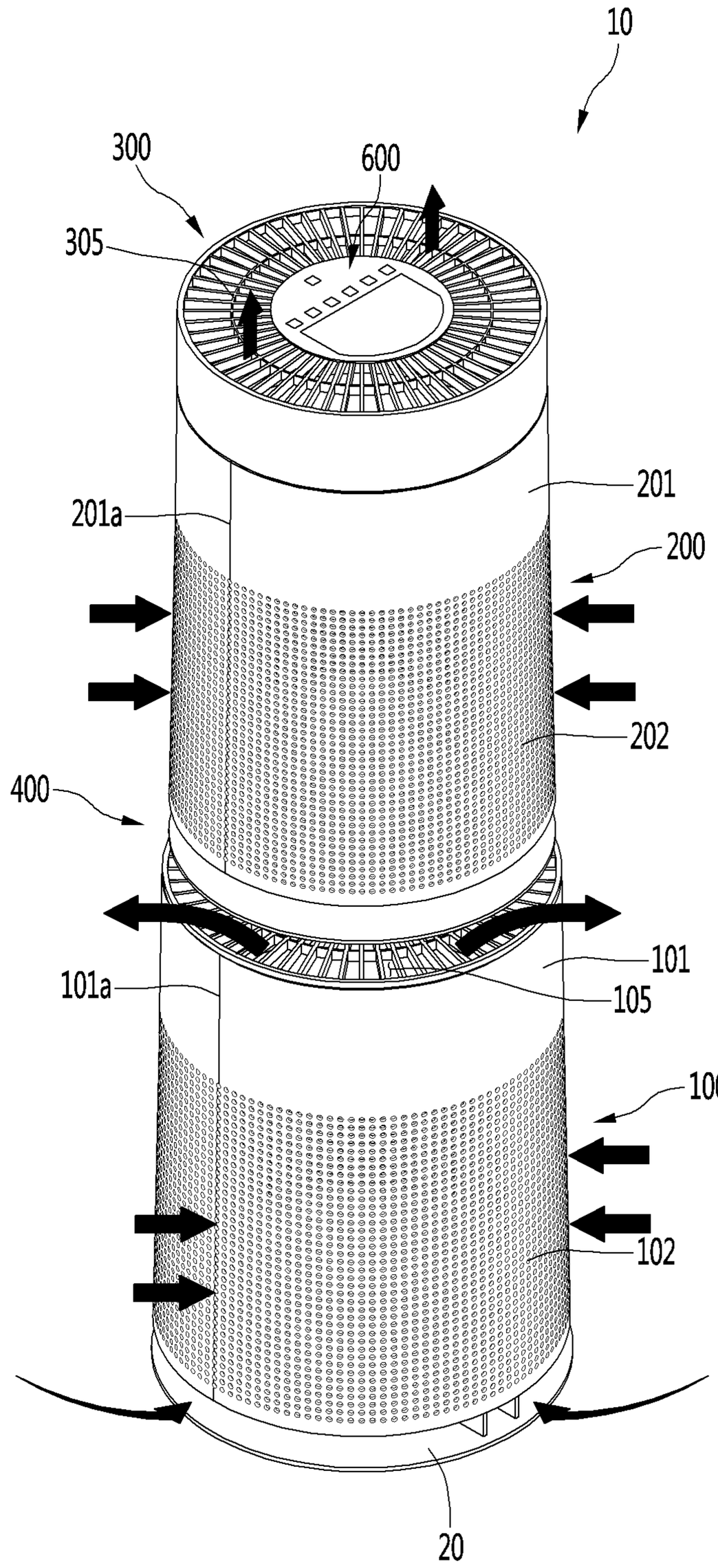


Fig. 23

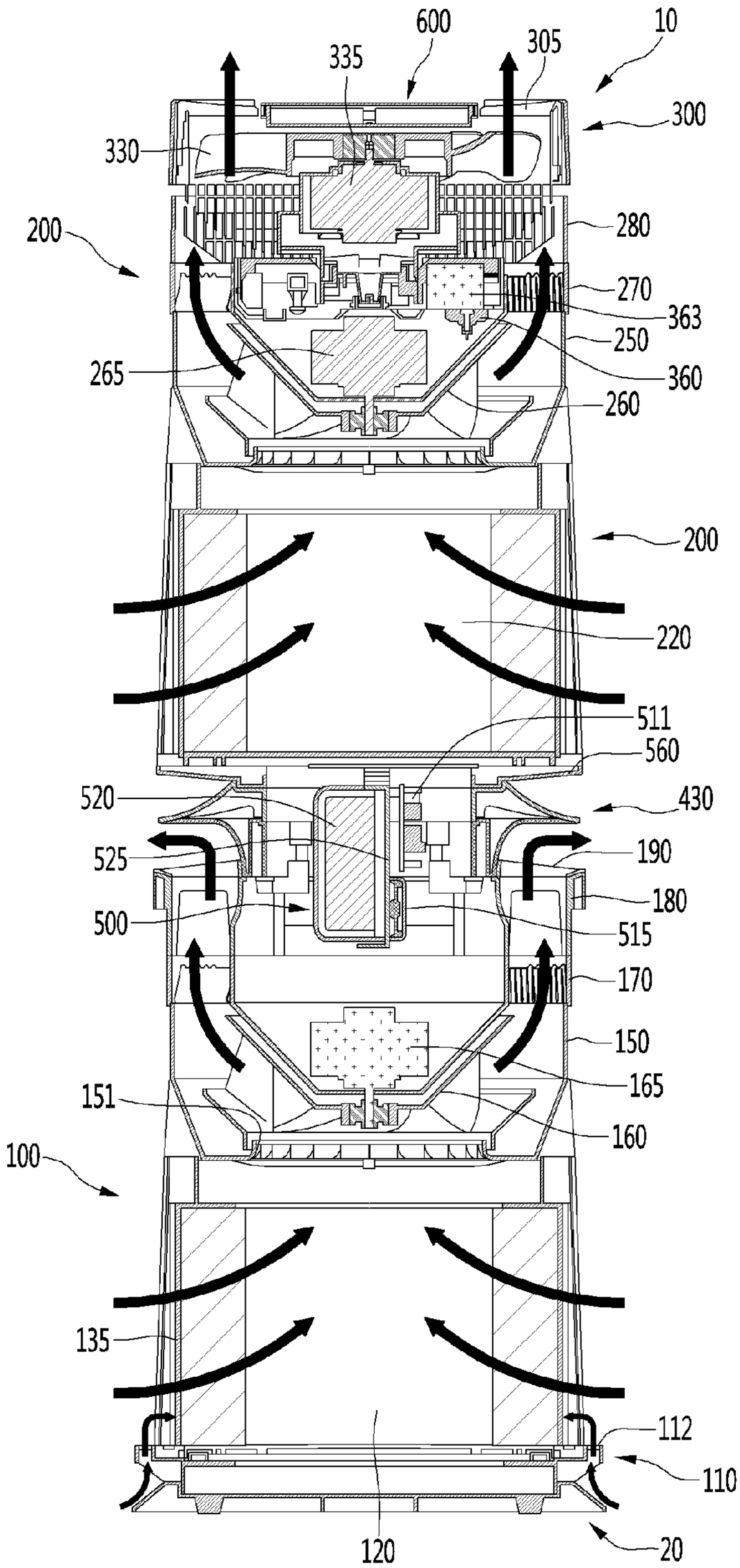
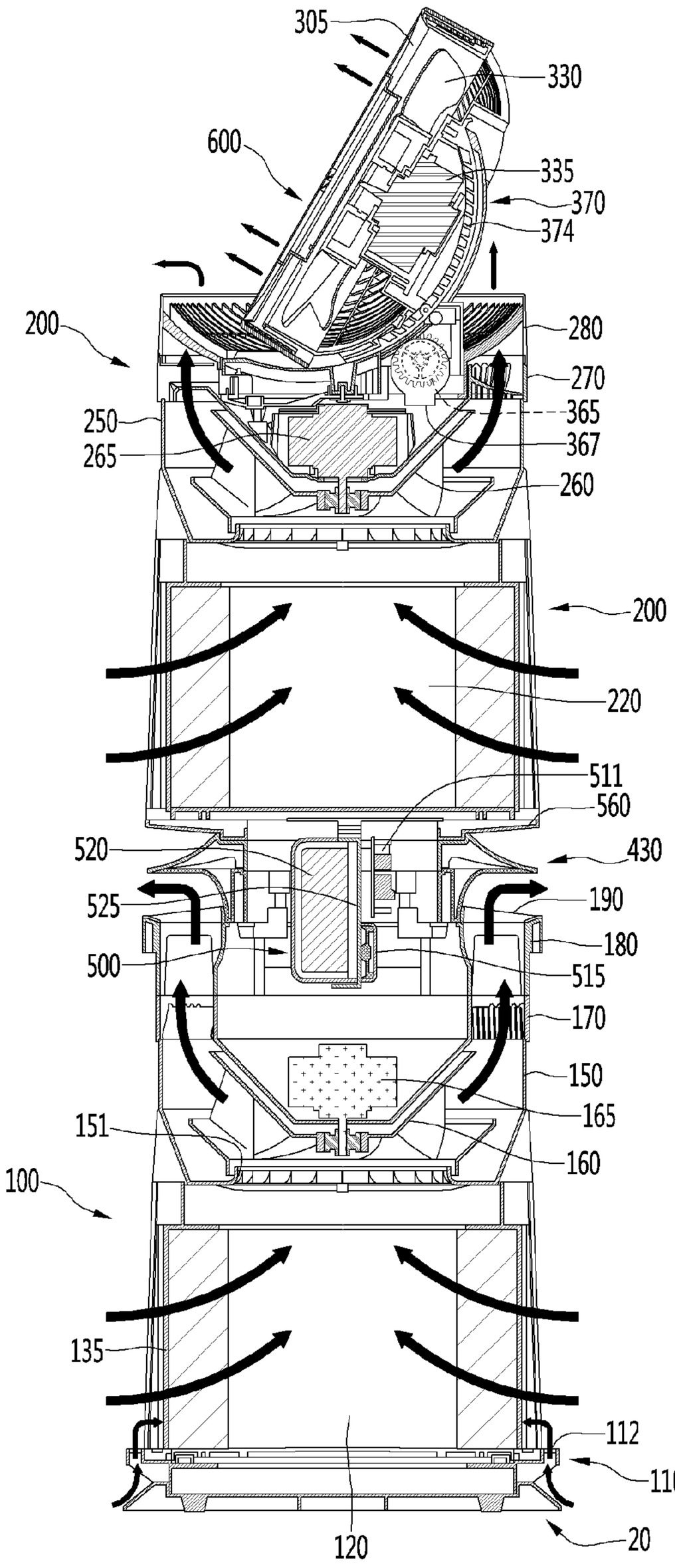

600
335
305
10
300
330
200
280
270
363
250
265
360
260
200
220
511
560
520
430
525
190
180
500
515
170
150
165
151
160
100
135
112
110
120
20

Fig. 24


305
330
600
335
370
374
200
280
270
250
365
265
367
260
200
220
511
560
520
430
525
190
180
500
515
170
150
165
151
160
100
135
112
110
120
20

AIR CLEANER

CROSS-REFERENCE TO RELATED APPLICATION(S)

The present application claims priority under 35 U.S.C. 119 and 35 U.S.C. 365 to Korean Patent Application No. 10-2016-0077888 filed in Korea on Jun. 22, 2016, No. 10-2016-0023663 filed in Korea on Feb. 26, 2016, and No. 10-2016-0139376 filed in Korea on Oct. 25, 2016, which are hereby incorporated by reference in their entirety.

BACKGROUND

1. Field

An air cleaner is disclosed herein.

2. Background

An air cleaner is a device that suctions in and purifies contaminated air and then discharges purified air. For example, the air cleaner may include a blower that introduces outside air into the air cleaner and a filter capable of filtering dust and bacteria, for example.

Generally, the air cleaner is configured to purify an indoor space, such as a home or an office. According to the air cleaner in the related art, there is a problem that a capacity thereof is limited, and thus, purification of air in an entire indoor space is limited. Accordingly, air around the air cleaner is purified whereas air in a space away from the air cleaner is not purified.

In order to solve this problem, there are efforts to improve a performance of a fan provided in the air cleaner. However, noise generated by the fan gradually increases as a blowing amount of the fan increases. Accordingly, there is a problem is that reliability of the product is decreased. Finally, there is inconvenience that the air cleaner has to be moved by a user in order to purify air in the desired space.

A related art air cleaner is disclosed in Korean Publication No. KR10-2012-0071992 published on Jul. 3, 2012 and entitled AIR CLEANER, which is hereby incorporated by reference. According to this disclosure, air cleaning components, such as the fan and a filter are installed, in an inside of a case having a substantially rectangular parallelepiped shape of a main body of the air cleaner. Air suction ports are formed on a side portion and a lower portion of the main body of the air cleaner and an air discharge port is formed on an upper portion of the main body thereof.

According to this configuration, there is a problem in that a suction capacity is reduced as the contaminated air is suctioned from a limited direction, that is, from a side direction and a lower direction relative to the air cleaner. A corner portion of the case having a rectangular parallelepiped shape provides structural resistance interfering with the suction of air.

In addition, there is a problem that an air cleaning function is limited as purified air does not flow to a space away from the air cleaner, whereas air around the air cleaner is purified. That is, the air which is purified in the air cleaner is discharged in only one direction, that is, only in an upward direction. Further, there is a problem that a blowing capacity is limited as only one blowing fan is provided in the main body of the air cleaner.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments will be described in detail with reference to the following drawings in which like reference numerals refer to like elements, and wherein:

FIG. **1** is a perspective view of an air cleaner according to an embodiment;

FIG. **2** is a perspective view illustrating an internal configuration of the air cleaner of FIG. **1**;

FIG. **3** is a cross-sectional view, taken along line III-III' in FIG. **2**;

FIG. **4** is an exploded perspective view of a second blowing device of the air cleaner of FIG. **1**;

FIG. **5** is an exploded perspective view illustrating a third air guide and a second discharge guide of the air cleaner of FIG. **1**;

FIG. **6** is an exploded perspective view of an air flow control device and a component to which the air flow control device is coupled of the air cleaner of FIG. **1**;

FIG. **7** is a perspective view of the air flow control device of FIG. **6**;

FIG. **8** is a view illustrating a state in which the third air guide and the second discharge guide of FIG. **5** are coupled to each other;

FIG. **9** is a view illustrating a state in which a first guide acts to perform rotation in a lateral direction of the air flow control device according to an embodiment;

FIG. **10** is a sectional view of the air flow control device according to an embodiment;

FIG. **11** is an exploded perspective view of the air flow control device according to an embodiment;

FIG. **12** is an exploded perspective view of a drive portion and a fixing portion of the air flow control device according to an embodiment;

FIG. **13** is a view illustrating a state in which a second rack and a second gear, which are provided in the air flow control device, are interlocked with each other according to an embodiment;

FIGS. **14** and **15** are views illustrating a state in which the air flow control device is located at a second position according to an embodiment;

FIG. **16** is a view illustrating a state in which the air flow control device of FIG. **14** is rotated in direction A;

FIG. **17** is an exploded perspective view of a display device which is coupled to a discharge grill according to an embodiment;

FIG. **18** is a view illustrating a state in which a printed circuit board (PCB) assembly is coupled to the discharge grill according to an embodiment;

FIG. **19** is an exploded perspective view of the PCB assembly of FIG. **18**;

FIG. **20** is a view of an upper surface of a display device according to an embodiment;

FIG. **21** is a view of a lower surface of the PCB assembly according to an embodiment; and

FIGS. **22** to **24** are views illustrating a state in which air flows in the air cleaner of FIG. **1**.

DETAILED DESCRIPTION

Hereinafter, embodiments will be described in detail with reference to the illustrative drawings. Regarding the reference numerals assigned to the components in the drawings, it should be noted that the same components may be designated by the same reference numerals, wherever possible, even though they are shown in different drawings. Also, in the description of embodiments, specific description of known related configuration or functions may be omitted when it is deemed that such description may cause ambiguous interpretation of the present invention.

Also, in the description of embodiments, terms such as first, second, A, B, (a), (b) or the like may be used herein

when describing components. Each of these terminologies is not used to define an essence, order or sequence of a corresponding component but used merely to distinguish the corresponding component from other component(s). In a case where it is described that any component is "connected" or "coupled" to another component, the component may be directly or indirectly connected or coupled to another component. However, it is to be understood that another component may be "connected" or "coupled" between the components.

Also, in the description of embodiments, terms such as first, second, A, B, (a), (b) or the like may be used herein when describing components. Each of these terminologies is not used to define an essence, order or sequence of a corresponding component but used merely to distinguish the corresponding component from other component(s). In a case where it is described that any component is "connected" or "coupled" to another component, the component may be directly or indirectly connected or coupled to another component. However, it is to be understood that another component may be "connected" or "coupled" between the components.

FIG. **1** is a perspective view of an air cleaner according to an embodiment. With reference to FIG. **1**, the air cleaner **10** according to this embodiment may include blowing devices or blowers **100** and **200** that generate air flow and a flow adjusting device or adjuster **300** that adjusts a discharge direction of the air flow generated in the blowing devices **100** and **200**. The blowing devices **100** and **200** may include a first blowing device **100** that generates a first air flow and a second blowing device **200** that generates a second air flow.

The first blowing device **100** and the second blowing device **200** may be provided in a vertical direction. For example, the second blowing device **200** may be provided on or at an upper side of the first blowing device **100**. In this case, the first air flow is a flow of indoor air suctioned from a lower side of the air cleaner **10** and the second air flow is a flow of indoor air suctioned from an upper side of the air cleaner **10**.

The air cleaner **10** may include cases **101** and **201** that form an outer appearance thereof. That is, the cases **101** and **201** may include a first case **101** that forms an outer appearance of the first blowing device **100**. The first case **101** may have a cylindrical shape. An upper portion of the first case **101** may have a diameter which is less than a diameter of a lower portion thereof. That is, the first case **101** may have a truncated cone shape.

The first blowing device **100** and the second blowing device **200** may be referred to as a "first air cleaning module or cleaner **100**" and a "second air cleaning module or cleaner **200**", respectively, in that the first blowing device **100** and the second blowing device **200** perform a function of cleaning air in a space to be cleaned. The first blowing device **100** may be referred to as a "lower air cleaning module or cleaner" or "lower module or cleaner" in that the first blowing device **100** is provided at a lower portion of the air cleaner **10** and the second blowing device **200** may be referred to as an "upper air cleaning module or cleaner" or "upper module or cleaner" in that the second blowing device **200** is provided at an upper portion of the air cleaner **10**. The flow adjusting device **300** may be referred to as "flow adjusting module or adjuster **300**" or "flow control module **300**".

The first case **101** may include a first separation portion **101***a* at which two parts which constitute the first case **101** may be assembled or disassembled. The first case **101** may further include a hinge portion or hinge which is provided on an opposite of the first separation portion **101***a*. The two parts may be capable of being relatively rotated about the hinge portion.

When at least any one part of the two parts rotates, the first case **101** may be opened and separated from the air cleaner **10**. A locking device or lock may be provided at a portion at which the two parts are coupled, that is, a side opposite to the hinge portion. The locking device may include a locking projection or a magnet member or magnet. Components of the first blowing device **100** may be replaced or repaired by opening the first case **101**.

The first case **101** may include a first suction portion or inlet **102** through which air may be suctioned in a radial direction. The first suction portion **102** may include one or more through hole formed to pass through at least a portion of the first case **101**. A plurality of first suction portions **102** may be provided.

The plurality of first suction portions **102** may be evenly provided in a circumferential direction along an outer circumferential surface of the first case **101** so that air suction may be performed in any direction relative to the first case **101**. That is, air may be suctioned in 360 degree directions relative to a center line that extends in the vertical direction and passes through an inside center of the first case **101**.

Accordingly, a suction amount of air may be increased by the first case **101** having a cylindrical shape and the plurality of first suction portions **102** formed along the outer circumferential surface of the first case **101**. Flow resistance to suctioned air may be reduced by avoiding a cube shape having edges or edge portions such as the case of the related art air cleaner.

Air which is suctioned in through the first suction portion **102** may flow substantially in the radial direction from the outer circumferential surface of the first case **101**. Directions may be defined as follows. Referring to the FIG. **1**, the vertical direction may refer to an axial direction and a transverse direction may refer to the radial direction. The axial direction may correspond to a central axis direction of the first fan **160** and the second fan **260**, which are described hereinafter, that is, a motor shaft direction of the fan. The radial direction may refer to a direction which is perpendicular to the axial direction. The circumferential direction may refer to a virtual circle direction which is formed when rotating about the axial direction and having a distance of the radial direction as a rotational radius.

The first blowing device **100** may include a base **20** provided at a lower side of the first case **101** and placed on the ground. The base **20** may be positioned spaced apart from a lower end portion or end of the first case **101** in a downward direction. A base suction portion or inlet **103** may be formed in a space between the first case **101** and the base **20**.

Air which is suctioned in through the base suction portion **103** may flow in an upward direction through a suction port **112** of a suction grill **110** (see FIG. **2**), which may be provided in or at an upper side of the base **20**. That is, the first blowing device **100** may include the plurality of suction portions **102** and the base suction portion **103**. Air in a lower portion of the indoor space may be easily introduced to the first blowing device **100** through the plurality of suction portions **102** and the base suction portion **103**. Accordingly, the suction amount of air may be increased.

A first discharge portion or outlet **105** may be formed at an upper portion of the first blowing device **100**. The first discharge portion **105** may be formed on a first discharge grill **195** of a first discharge guide device or guide **190** (see,

FIG. **8**) which may be provided in the first blowing device **100**. The first discharge guide **190** may form an outer appearance of an upper end portion or end of the first blowing device **100**. Air discharged through the first discharge portion **105** may flow to the upper side in the axial direction.

The cases **101** and **201** may include a second case **201** which may form an outer appearance of the second blowing device **200**. The second case **201** may have a cylindrical shape. An upper portion of the second case **201** may have a diameter which is less than a diameter of a lower portion thereof. That is, the second case **201** may have a truncated cone shape.

The second case **201** may include two parts and a hinge portion or hinge which are capable of being assembled or being disassembled through a second separation portion **201***a*. The second case **201** may be openable similar to the first case **101**. The second case **201** may be the same or similar to the first case **101**, and thus, repetitive disclosure has been omitted. Inner components of the second blowing device **200** may be replaced or repaired by opening the second case **201**.

A diameter of a lower end portion of the second case **201** may be less than a diameter of the upper end portion or end of the first case **101**. Accordingly, in a general shape of the cases **101** and **201**, a lower cross-sectional area of the cases **101** and **102** may be formed to be greater than an upper cross-sectional area. Accordingly, the air cleaner **10** may be stably supported on the ground.

The second case **201** may include a second suction portion or inlet **202** through which air may be suctioned in the radial direction. The second suction portion **202** may include one or more through hole formed to pass through at least a portion of the second case **201**. A plurality of the second suction portion **202** may be provided.

The plurality of second suction portions **202** may be evenly provided in the circumferential direction along an outer circumferential surface of the second case **201** so that air suction may be performed in any direction relative to the second case **201**. That is, air may be suctioned in 360 degree directions relative to a center line that extends in the vertical direction and passes through an inside center of the second case **201**.

Accordingly, a suction amount of air may be increased by the second case **201** having a cylindrical shape and the plurality of second suction portions **202** formed along the outer circumferential surface of the second case **201**. Flow resistance to suctioned air may be reduced by avoiding a cube shape having an edge portions such as the case of the related are air cleaner. Air which is suctioned in through the second suction portion **202** may flow substantially in the radial direction from the outer circumferential surface of the second case **201**.

The air cleaner **10** may include a dividing device or divider **400** provided between the first blowing device **100** and the second blowing device **200**. By the dividing device **400**, the second blowing device **200** may be positioned at the upper side of the first blowing device **100** spaced apart therefrom. The dividing device **400** will be described hereinafter, with reference to the drawings.

The flow adjusting device **300** may be provided at an upper side of the second blowing device **100**. An air flow path of the second blowing device **100** may communicate with an air flow path of the flow adjusting device **300**. The air passing through the second blowing device **100** may be discharged through a second discharge portion or outlet **305** to the outside via the air flow path of the flow adjusting device **300**. The second discharge portion **305** may be provided on or at an upper end portion of the flow adjusting device **300**.

The flow adjusting device **300** may be movable. That is, the flow adjusting device **300** may be movable between a laid-out state (first position), as illustrated in FIG. **1**, or an inclined erected state (second position), as illustrated in FIG. **18**. In addition, a display device or display **600** that displays operation information of the air cleaner may be provided at an upper portion of the flow adjusting device **300**. The display device **600** may be movable together with the flow adjusting device **300**.

FIG. **2** is a perspective view of the air cleaner of FIG. **1**. FIG. **3** is a cross-sectional view, taken along line III-III' of FIG. **2**.

Referring to FIGS. **2** and **3**, a base **20** and a suction grill **110**, which may be disposed or provided on or at an upper side of the base **20** may be included in the first blowing device **100** according to this embodiment. The base **20** may include a base main body **21**, which may be placed on the ground, and a base projecting portion or projection **22** that projects from the base main body **21** in the upward direction and on which the suction grill **110** may be placed. The base projecting portion **22** may be provided at both sides of the base **20**.

The base main body **21** and the suction grill **110** may be spaced apart from each other by the base projecting portion **22**. The base suction portion **103** which forms a suction space of air may be included between the base **20** and the suction grill **110**.

The suction grill **110** may include a grill main body **111** having a substantially ring shape and a rim portion or rim **110** that protrudes from an outer circumferential surface of the grill main body **111** in the upward direction. By the configuration of the grill main body **111** and the rim portion **111***a*, the suction grill **110** may have a stepped structure.

The suction grill **110** may include a suction portion or inlet **112** formed on the rim portion **111***a*. The suction portion **112** may protrude along a circumference of the rim portion **111***a* in the upward direction and extend in a circumferential direction. In addition, a plurality of suction holes **112***a* may be formed in the suction portion **112**. The plurality of suction holes **112***a* may communicate with the base suction portion **103**.

Air suctioned in through the plurality of suction holes **112***a* and the base suction portion **103** may pass through a first filter member or filter **120**. The first filter may have a cylindrical shape and a filter surface that filters air. The air passing through the plurality of suction holes **112***a* may be introduced to an inside portion of the first filter **120** by passing through an outer circumferential surface of the cylindrical first filter **120**.

The first blowing device **100** may further include a first filter frame **130**, which may form a mounting space of the first filter **120**. That is, the first filter frame **130** may include a first frame **131** which forms a lower portion of the first filter frame **130** and a second frame **132** which forms an upper portion of the first filter frame **130**.

The first filter frame **130** may further include a first filter supporting portion or support **135** that extends from the first frame **131** to the second frame **132** in the upward direction. The first frame **131** and the second frame **132** may be spaced apart from each other by the first filter supporting portion **135**. A plurality of first filter supporting portions **135** may be provided and the plurality of the first filter supporting portions **135** may be arranged in the circumferential direction, and thus, may be connected to rim portions or rims of

the first frame **131** and the second frame **132**. A mounting space of the first filter **120** is defined by the plurality of first filter supporting portions **135** and the first frame **131** and the second frame **132**. In addition, a first supporting portion cover **136** may be coupled to an outside of the first filter supporting portion **135**.

A sensor device or sensor **137** may be installed or provided in or on the first filter frame **130**. The sensor device **137** may include a dust sensor that senses an amount of dust in the air and a gas sensor that senses an amount of gas in the air. The dust sensor and the gas sensor may be disposed or provided to be supported by the second frame **132** of the first filter frame **130**.

The first filter **120** may be detachably mounted in the mounting space. The first filter **120** may have a cylindrical shape and air may be introduced through the outer circumferential surface of the first filter **120**. Impurities, such as fine dust in air, may be filtered in a process of passing through the first filter **120**.

The air may be introduced from any direction relative to the first filter **120**, by the first filter **120** having the cylindrical shape. Accordingly, a filtering area of air may be increased.

The mounting space may have a cylindrical shape corresponding to the shape of the first filter **120**. The first filter **120** may be slidably introduced toward the mounting space in a mounting process. In contrast, the first filter **120** may be slidably withdrawn from the mounting space in a separating process.

The first blowing device **100** may further include a first fan housing **150**, which may be installed or provided on or at an outlet side of the first filter **120**. A housing space portion or space **152**, in which a first fan **160** may be accommodated, may be formed in the first fan housing **150**. In addition, the first fan housing **150** may be supported by the first filter frame **130**.

A first fan introducing portion **151** that guides introduction of air to an inside of the first fan housing **150** may be included in a lower portion of the first fan housing **150**, A grill may be provided in or on the first fan introducing portion **151** to prevent, for example, a finger of a user from being put into the inside of the first fan housing **150** when the first filter **150** is separated.

The first blowing device **100** may further include an ionizer **158** that removes or sterilizes smell particles in the air. The ionizer **158** may be coupled to the first fan housing **150** and be capable of acting on the air which flows inside of the first fan housing **150**.

The sensor device **137** and the ionizer **158** may also be installed or provided in a second blowing device **200** described hereinafter. For example, the sensor device **137** and the ionizer **158** may be installed or provided in one of the first blowing device **100** or the second blowing device **200**.

The first fan **160** may be located on or at an the upper side of the first fan introducing portion **151**. For example, the first fan **160** may include a centrifugal fan that introduces air in the axial direction and then discharges air to the upper side in the radial direction.

The first fan **160** may include a hub **161** to which a rotational shaft **165***a* of a first fan motor **165**, which may be a centrifugal fan motor, may be coupled, a shroud **162** which may be disposed or provided in a state of being spaced apart from the hub **161**, and a plurality of blades **163**, which may be disposed or provided between the hub **161** and the shroud **162**. The first fan motor **165** may be coupled to the upper side of the first fan **160**.

The hub **161** may have a bowl shape, a diameter of which may be gradually reduced in the downward direction. The hub **161** may include a shaft coupling portion to which the rotational shaft **165***a* may be coupled and a first blade coupling portion that extends at an incline from the shaft coupling portion in the upward direction.

The shroud **162** may include a lower end portion or end, on or at which a shroud suction port, into which air having passed through the first fan introducing portion **151** may be suctioned, may be formed and a second blade coupling portion that extends from the lower end portion in the upward direction.

A first surface of each blade **163** may be coupled to the first blade coupling portion of the hub **161** and a second surface thereof may be coupled to the second blade coupling portion of the shroud **162**. The plurality of blades **163** may be disposed or provided spaced apart in a circumferential direction of the hub **161**.

The first blowing device **100** may further include a first air guide device or guide **170** that guides a flow of air being passed through the first fan **160** by being coupled to an upper side of the first fan **160**.

The first air guide **170** may include an outer wall **171** having a cylindrical shape and an inner wall **172** positioned on or at an inside of the outer wall **171** and having a cylindrical shape. The outer wall **171** may be disposed or provided to surround the inner wall **172**. A first air flow path **172***a*, through which air may flow may include circumferential surface of the outer wall **171** and an outer circumferential surface of the inner wall **172**.

The first air guide **170** may include a guide rib **175** which may be disposed or provided on or in the first air flow path **172***a*. The guide rib **175** may extend from the outer circumferential surface of the inner wall **172** to the inner circumferential surface of the outer wall **171**. A plurality of guide ribs **175** may be disposed or provided spaced apart from each other. The plurality of guide ribs **175** may guide the air introduced to the first air flow path **172***a* of the first air guide **170** via the first fan **160** in the upward direction.

The guide rib **175** may extend at an incline from a lower portion of the outer wall **171** and the inner wall **172** in the upward direction. For example, the guide rib **175** may be rounded, and thus, guide air so that it flows at an incline in the upward direction.

The first air guide **170** may further include a motor accommodating portion **173** that extends from the inner wall **172** to the lower side, and thus, accommodates the first fan motor **165**. The motor accommodating portion **173** may have a bowl shape, a diameter of which may be gradually reduced in the downward direction. A motor coupling portion **166** may be provided on or at one side of the first fan motor **165** to fix the first fan motor **165** to the first air guide **170**. A shape of the motor accommodating portion **173** may correspond to the shape of the hub **161**. The motor accommodating portion **173** may be inserted into the hub **161**.

The first fan motor **165** may be supported to or at an upper side of the motor accommodating portion **173**. The rotational shaft **165***a* of the first fan motor **165** may extend from the first fan motor **165** in the downward direction and be coupled to the shaft coupling portion **161***a* of the hub **161** through the lower surface portion of the motor accommodating portion **173**.

The first blowing device **100** according to this embodiment may further include a second air guide device or guide **180** which may be coupled to an upper side of the air guide **170** and guide air having passed through the first air guide **170** to the discharge guide **190**.

The second air guide **180** may include a first guide wall **181**, which may have a substantially cylindrical shape, and a second guide wall **182**, which may be positioned at an inside of the first guide wall **181** and have a substantially cylindrical shape. The first guide wall **181** may be disposed or provided to surround the second guide wall **182**.

A second air flow path **185**, through which air may flow, may be formed between an inner circumferential surface of the first guide wall **181** and an outer circumferential surface of the second guide wall **182**. Air which flows along the first air flow path **172***a* of the first air guide **170** may flow in the upward direction through the second air flow path **185**. The second air flow path **185** may be referred to as a "discharge flow path." In addition, the first discharge portion **105** may be provided on or at an upper side of the second air flow path **185**.

A space portion or space, in which at least a portion of a printed circuit board (PCB) device **500** may be accommodated by passing therethrough in the vertical direction may be formed inside of the second guide wall **182** having a cylindrical shape. The PCB device **500** may include a power supply portion or power supply **520** and a main PCB **511**.

The power supply portion **520** may refer to a device that receives commercial power supplied from a power line connected to the air cleaner **10** to supply power to the main PCB **511** and a plurality of components in the air cleaner **10**. The power supply **520** may include a PCB (power PCB) for AC power. The main PCB **511** may include a PCB for DC power, which may be driven by a DC voltage converted in the PCB for AC power.

The PCB device **500** may further include a PCB supporting plate **525** that supports the power supply portion **520** and the main PCB **511**. The main PCB **511** may be supported on one or a first surface of the PCB supporting plate **525**, and the power supply portion **520** may be supported on the other or a second surface of the PCB supporting plate **525**.

The PCB device **500** may include a communication module **515** through which the air cleaner **10** is capable of communicating with an external device. For example, the communication module **515** may include a Wi-Fi module. The communication module **515** may be supported on the PCB supporting plate **525**, and may be disposed or provided at a lower side of the main PCB **511**.

The first blowing device **100** may further include a first discharge guide device or guide **190**, which may be disposed or provided on or at an upper side of the second air guide **180**, that is, an outlet side of air flow passing through the second air guide **180** relative to the air flow and guide the air discharge to outside of the air cleaner **10**. A first discharge portion **105**, through which air may be discharged, may be formed in the first discharge guide **190**.

The second blowing device **200** may include a second filter member or filter **220**, a supporting device or support **240** that supports a lower portion of the second filter **220**, and a lever device or lever **242** provided on or at a lower side of the supporting device **240** to support the second filter **220** and the supporting device **240** (see FIG. **4**).

The second blowing device **200** may further include a lever supporting device or support **210** that supports the second filter **220** or the lever device of the second blowing device **200**. The lever supporting device **560** may have a substantially annular shape. The lever supporting device **560** may include a space portion or space which defines an installation space portion or space, in which the PCB device **500** may be located. The space portion may be formed at a substantially center portion of the lever supporting device **560** by passing through the lever supporting device **560** in the vertical direction.

A dividing device **400** may be provided between the first blowing device **100** and the second blowing device **200**. The dividing device **400** may include a dividing plate **430** that separates or blocks air flow generated in the first blowing device **100** and air flow generated in the second blowing device **200**. By the dividing plate **430**, the first and second blowing devices **100** and **200** may be spaced apart from each other in the vertical direction.

That is, a separation space in which the dividing plate **430** may be located or provided may be formed between the first and second blowing devices **100** and **200**. The first discharge guide **190** of the first blowing device **100** may be located at a lower end portion or end of the separation space, and the lever supporting device **510** of the second blowing device **200** may be located at an upper end portion or end of the separation space.

The separation space may be divided into an upper space and a lower space by the dividing plate **430**. The lower space may be a first space portion or space through which air discharged from the first discharge portion **105** of the first discharge guide **190** may pass in a process in which the air flows to the outside of the air cleaner **10**. The upper space may be a second space portion or space that functions as a grasping space into which a user may put his or her hand when moving the air cleaner **10**.

Air discharged from the first discharge portion **105** may be guided by the dividing plate **430** to flow to the outside of the air cleaner **10**. Accordingly, it is possible to prevent the air from being introduced into the second blowing device **200**.

FIG. **4** is an exploded perspective view of the second blowing device of the air conditioner of FIG. **1**. Referring to FIG. **4**, the second blowing device **200** according to this embodiment may include the lever supporting device **560**, a lever device **242**, the supporting device or support **240**, the second filter **220**, the second filter frame **230**, a second fan housing **250**, and a second fan **260**.

The second filter **220** may have a cylindrical shape having an open upper portion. The second filter **220** may include a filter main body **221**, which may have a cylindrical filter portion an inside of which is empty, and a filter hole **222**, which may be opened at an upper end portion or end of the filter main body **221**. A filter grasping portion or grasp **221***a* may be provided at an upper or lower portion of the filter main body **221**. Air may be introduced to the inside of the filter main body **221** through an outer circumferential surface of the filter main body **221**, and may be discharged from the second filter **220** through the filter hole **222**. The second filter **220** may be the same as or similar to the first filter **120**, and thus, repetitive disclosure has been omitted.

The lever supporting device **560** may include a lever supporting main body **561** having an annular shape. The lever supporting main body **561** may extend at a slight incline in the upward direction with respect to the axial direction toward an outer circumferential surface from an inner circumferential surface thereof. That is, a surface which forms the lever supporting main body **561** may be an inclined surface. A space between the inclined surface and an upper surface of the dividing plate **430** may provide a space portion or space **458** in which a user's hand may be located. The lever supporting main body **561** may be referred to as a "blocking portion" in that air discharged

through the first discharge portion **105** of the first blowing device **100** may be blocked from being introduced to the second blowing device **200**.

The lever supporting device **560** may further include a movement guide portion or guide **565**, which may protrude from the lever supporting main body **561** in the upward direction. A plurality of movement guides **565** may be spaced apart from one another in a circumferential direction of the lever supporting main body **561**. In addition, the lever supporting device **560** may further include a supporting projection **566** that protrudes in the upward direction from an inner circumferential surface of the lever supporting main body **561**. The supporting projection **566** may support the lever device **242** of the second blowing device **200**.

The lever device **242** may be operable by a user. For example, the lever device **242** may be rotatable in the circumferential direction. The lever device **242** may include a lever main body **243**, which may have a substantially ring shape and be rotatable. In addition, a plurality of cut-out portions or cut-outs **245**, which may be disposed or provided at positions corresponding to the plurality of movement guides **565**, may be formed in the lever main body **243**.

The plurality of cut-out portions **245** may be spaced apart from one another, and arranged in the circumferential direction of the lever main body **243**. In addition, each of the plurality of cut-out portions **245** may be rounded with a predetermined curvature in the circumferential direction, corresponding to a curvature of the outer circumferential surface of the lever main body **243**.

The lever device **142** may be supported on an upper surface of the lever supporting main body **561**. If the lever device **242** is supported by the lever supporting main body **561**, the plurality of movement guides **565** may be inserted into the plurality of cut-out portions **245**. That is, the plurality of movement guides **565** may protrude to the upper side of the plurality of cut-out portions **245** by passing through the plurality of cut-out portions **245**.

A length of each of the plurality of cut-out portions **245** may be longer than a length of the movement guide **565**. Thus, the lever device **242** may rotate in a state in which the movement guide **565** is inserted into the cut-out portion **245**. In addition, one end portion or end of the movement guide **565** may interfere with one end portion or end of the cut-out portion **245** in a process in which the lever device **242** rotates in one or a first direction, and the other end portion or end of the movement guide **565** may be interfere with the other end portion or end of the cut-out portion **245**. A second handle **244** may be provided on an outer circumferential surface of the lever main body **243**.

The supporting device **240**, which supports the second filter **220**, may be provided on or at an upper side of the lever device **242**. The supporting device **240** may include a first handle **241** which may be coupled to the second handle **244**. A user may rotate the lever main body **143** and the supporting device **140** in a clockwise direction or in a counterclockwise direction by grasping the first and second handles **241** and **244**. The lever device **242** may support a lower surface of the supporting device **240**. The supporting device **240** may include a support projecting portion or projection (not shown), which may be in contact with the movement guide **565**. The support projecting portion may protrude in the downward direction from a lower surface of the supporting device **240**, and may be provided at a position corresponding to the movement guide **565**. In addition, a shape of the support projecting portion may correspond to a shape of the movement guide **565**, and include an inclined surface that gradually protrudes in the circumferential direction. In addition, a direction in which the movement guide **565** gradually protrudes and a direction in which the support projecting portion gradually protrudes may be opposite to each other.

For example, if the direction in which the movement guide **565** protrudes is the counterclockwise direction, the direction in which the support projecting portion protrudes may be the clockwise direction. The support projecting portion may be disposed or provided at a position corresponding to the cut-out portion **245**. That is, the movement guide **565** and the support projecting portion may be disposed or provided at a position at which they are inserted into the cut-out portion **245**.

The lever device **242** and the supporting device **240** may rotate together. In the rotation process, the movement guide **565** and the support projecting portion may interfere with each other. That is, if a lower portion of the support projecting portion and an upper portion of the movement guide **565** are in contact with each other, the lever device **242** and the supporting device **240** may be lifted in the upward direction. In addition, the second filter **220** supported by the supporting device **240** may be in a state in which the second filter **220** is coupled to the second blowing device **200** while moving in the upward direction.

On the other hand, if the lower portion of the support projecting portion and the upper portion of the movement guide **565** are in contact with each other or if the inference between the support projecting portion and the movement guide **565** is released, the lever device **242** and the supporting device **240** may move downward. In addition, the second filter **220** supported by the supporting device **240** may be in a state (released state) in which the second filter **220** is separable from the second blowing device **200**.

The second blowing device **200** may include a second filter frame **230**, which may form a mounting space for the second filter **220**. That is, the second filter frame **230** may include a first frame **231**, which may form a lower portion of the second filter frame **230**, and a second frame **232**, which may form an upper portion of the second filter frame **230**.

The first frame **231** may include a frame depression portion or depression **231***a* having a downwardly depressed shape. The frame depression portion **231***a* may be configured such that at least a portion of the first frame **231** is depressed. The frame depression portion **231***a* may provide a space portion or space, in which the first and second handles **241** and **244** may be movable. The first and second handles **241** and **244** may be located in the space portion, to rotate in the clockwise direction or in the counterclockwise direction.

The second frame **232** may be spaced apart from the first frame **231** in the upward direction. The second frame **232** may have a substantially ring shape. The ring-shaped inside portion space of the second frame **232** may form at least a portion of an air flow path passing through the second filter frame **230**. In addition, an upper portion of the second frame **232** may support the second fan housing **250**.

The second filter frame **230** may further include a second filter supporting portion or support **235** that extends from the first frame **231** to the second frame **232** in the upward direction. The first frame **231** and the second frame **232** may be spaced apart from each other by the second filter supporting portion **235**. A plurality of second filter supporting portions **235** may be provided, and the plurality of the first second supporting portions **235** may be arranged in the circumferential direction, and thus, may be connected to rim portions or rims of the first frame **231** and the second frame **232**.

A mounting space for the second filter **220** may be defined by the first and second frames **231** and **232** and the plurality of second filter supporting portions **235**. In addition, a first supporting portion cover **236** may be coupled to an outside of the second filter supporting portion **235**.

A sensor device **237** may be installed or provided in or on the second filter frame **230**. The sensor device **237** may include a dust sensor **237***a* that senses an amount of dust in the air and a gas sensor **237***b* that senses an amount of gas in the air. The dust sensor **237***a* and the gas sensor **237***b* may be supported by the second frame **232** of the second filter frame **230**. The sensor device **237** may include a sensor cover **237***c* that covers the dust sensor **237***a* and the gas sensor **237***b*.

The second filter **220** may be detachably mounted on or in the mounting space. The second filter **220** may have a cylindrical shape and air may be introduced through an outer circumferential surface of the second filter **220**. Impurities, such as fine dust in air, may be filtered in a process of passing through the second filter **220**.

The air may be introduced from any direction relative to the second filter **220**, by the second filter **220** having the cylindrical shape. Accordingly, a filtering area of air may be increased. The mounting space may have a cylindrical shape corresponding to the shape of the second filter **220**. The second filter **220** may be slidably introduced toward the mounting space in a mounting process. In contrast, the second filter **220** may be slidably withdrawn from the mounting space in a separating process.

On the other hand, the second filter **220** may be slid toward the mounting space to the inside in the radial direction in a state of being separated from the mounting space, supported on the upper surface of the supporting device **240**, and thus, may be moved into close contact upwardly by an operation of the first and second handles **241** and **244**. At this time, the second filter **220** may be in a coupling position.

The second blowing device **200** may include a second fan housing **250**, which may be installed or provided on or at an outlet side of the second filter **220**. A housing space portion or space **252**, in which the second fan **260** may be accommodated, may be formed in the second fan housing **250**. The second fan housing **250** and the second fan **260** may be the same or similar to the first fan housing **150** and the first fan **160**, and therefore, repetitive disclosure has been omitted.

The second blowing device **200** may include an ionizer **258** that removes or sterilizes smell particles in the air. The ionizer **258** may be coupled to the second fan housing **250** and may act on the air which flows inside of the second fan housing **250**. The ionizer **258** may be the same as or similar to the ionizer of the first blowing device **100**, and therefore, repetitive disclosure has been omitted.

FIG. **5** is an exploded perspective view illustrating a third air guide and a second discharge guide of the air cleaner of FIG. **1**. FIG. **6** is an exploded perspective view of an air flow control device and a component to which the air flow control device is coupled of the air cleaner of FIG. **1**. FIG. **7** is a perspective view of the air flow control device of FIG. **6**. FIG. **8** is a view illustrating a state in which the third air guide and the second discharge guide of FIG. **5** are coupled to each other. FIG. **9** is a view illustrating a state in which a first guide acts to perform rotation in a lateral direction of the air flow control device according to an embodiment. FIG. **10** is a sectional view of the air flow control device according to an embodiment.

Referring to FIGS. **5** to **10**, the second blowing device **200** may include a third air guide device or guide **270** that guides a flow of air having passed through the second fan **260** by being coupled to an upper side of the second fan **260**. The third air guide **270** may include an outer wall **271** that forms an outer circumferential surface of the third air guide **270** and an inner wall **272** positioned inside of the outer wall **271** and having a cylindrical shape. A first air flow path **272***a*, through which air may flow, may be formed between an inner circumferential surface of the outer wall **271** and an outer circumferential surface of the inner wall **272**.

The third air guide **270** may include a guide rib **275** which may be disposed or provided on or in the first air flow path **272***a*. The guide rib **275** may extend from the outer circumferential surface of the inner wall **272** to the inner circumferential surface of the outer wall **271**.

The third air guide **270** may include a motor accommodating portion **273** that extends from the inner wall **272** in the downward direction, and thus, accommodates the second fan motor **265**. The motor accommodating portion **273** may have a bowl shape a diameter of which may be gradually reduced toward a lower side thereof.

The second fan motor **265** may be coupled to the upper side of the second fan **260**, and thus, provide a drive force to the second fan **260**. A motor coupling portion **266** may be provided on or at one side of the second fan motor **265**, and the motor coupling portion **266** may fix the second fan motor **265** to the third air guide **270**.

The third air guide **270** may include guide devices or guides **276** and **277** that guide a movement of the flow adjusting device **300**. The guides **276** and **277** may include a first rack **276** and a shaft guide groove **277**, which may be included in the motor accommodating portion **273**.

The first rack **276** may be linked to the first gear **360** of the flow adjusting device **300**. The first rack **276** may be provided on or at an inner circumferential surface of the motor accommodating portion **273** and may be provided along a set predetermined curvature in the circumferential direction. A length of the first rack **276** may be a length which is set based on a distance linked to the first gear **360**.

The flow adjusting device **300** may be rotated in the lateral direction, that is, in the clockwise direction or in the counterclockwise direction. In this process, the first gear **360** may be rotated along a predetermined rotating radius about a rotational shaft **354** of the flow adjusting device **300**.

The shaft guide groove **277** may be a groove that guides rotation of the first gear **260** and may extend rounded with a predetermined curvature. For example, the shaft guide groove **277** may be rounded in the circumferential direction. That is, the shaft guide groove **277** may have an arc shape.

The first gear shaft **362** of the first gear **360** may be inserted into the shaft guide groove **277**. In a process of rotation of the first gear **360**, the first gear shaft **360** may be moved along the shaft guide groove **277**.

The second blowing device **200** may include a second discharge guide **280**, which may be installed on or at an upper side of the third air guide **270** and guide a flow of air which passed through the third air guide **270**. The second discharge guide **280** may have a substantially annular shape an inside portion of which may be empty. That is, the second discharge guide **280** may include a discharge outer wall **281**, which may form an outer circumferential surface of the second discharge guide **280** and have a cylindrical shape, and a discharge inner wall **282** which may form an inner circumferential surface of the second discharge guide **280** and have a cylindrical shape.

The discharge outer wall **281** may surround the discharge inner wall **282**. A second air flow path **282***a*, that is, a discharge flow path along which air passing through the

third air guide **270** may flow, may be formed between an inner circumferential surface of the discharge outer wall **281** and an outer circumferential surface of the discharge inner wall **282**. The discharge flow path may be positioned on or at an upper side of the first air flow path **272***a*, in which the guide rib **275** may be provided.

The second discharge guide **280** may include a second discharge grill **288**, which may be disposed or provided on or in the discharge flow path **282***a*. The second discharge grill **288** may extend from the outer circumferential surface of the discharge inner wall **282** to the inner circumferential surface of the discharge outer wall **281**.

The second discharge guide **280** may further include a rotation guide plate **283**, which may be coupled to the discharge inner wall **282**. The rotation guide plate **283** may extend from the inner circumferential surface of the discharge inner wall **282** toward an inside center of the second discharge guide **280**.

The rotation guide plate **283** may include a shaft inserting portion **284**, which may provide a rotational center in the lateral direction of the flow adjusting device **300**. The rotational shaft **354** may be inserted into the shaft inserting portion **284**. The shaft inserting portion **284** may be positioned in the inside central portion of the second discharge guide **280**. The rotation guide plate **283** may be a supporting plate that supports the shaft inserting portion **284**.

A bearing groove **285** may be further included in the rotation guide plate **283**. A first bearing **353**, which may be provided on the flow adjusting device **300**, may be inserted into the bearing groove **285**. The bearing groove **285** may guide movement of the first bearing **353** and extend to be rounded with a predetermined curvature. For example, the bearing groove **285** may be rounded in the circumferential direction. That is, the bearing groove **285** may have an arc shape. In a process of rotation of the flow adjusting device **300** in the lateral direction, the first bearing **353** may be moved by inserted into the bearing groove **285**, and thus, allows a friction force which is generated in the process of rotation of the flow adjusting device **300** to be reduced.

The flow adjusting device **300** may include a third fan housing **310**, in which a third fan **330** may be accommodated. The third fan housing **310** may have a substantially annular shape. For convenience of description, the first fan **160** and the second fan **260** may be referred to as a "blowing fan," and the third fan **330** may be referred to as a "circulation fan." That is, the first fan **160** and the second fan **260** may be referred to as a "main fan," and the third fan **330** may be referred to as a "sub-fan."

The third fan housing **310** may include a housing cover **312**, which may form an outer appearance thereof. A housing main body **311**, which may have an annular shape, may be provided inside of the housing cover **312**. That is, the housing cover **312** may be coupled to an outer circumferential surface of the housing main body **311**, and may be supported by the housing main body **311**.

The housing main body **311** may include a cover supporting portion or support **311***a*, which may protrude from an outer circumferential surface of the housing main body **311** to support an inside of the housing cover **312**. The cover supporting portion **311***a* may have a bent shape, and an outer surface of the cover supporting portion **311***a* may be coupled to an inner surface of the housing cover **312**.

The housing cover **312** may surround the housing main body **311**, and the housing main body **311** and the housing cover **312** may be rotated or moved together. The third fan **330** may be accommodated inside of the housing main body **311**. In addition, a housing flow path **314**, through which air may flow as the third fan **330** is driven, may be formed inside of the housing main body **311**. A blade **333** of the third fan **330** may be located in the housing flow path **314**. By rotation of the blade **333**, air may flow in the upward direction via the housing flow path **314**. The housing flow path **314** may extend from a space in which the blade **333** is located to an upper space of the blade **333**.

A discharge grill **315**, which may form the second discharge portion **305** through which air passing through the third fan **330** may be discharged, may be provided on or at an upper side of the third fan housing **310**. That is, referring to FIG. **17**, the discharge grill **315** may include a grill outer wall **316**, a grill inner wall **317** provided at an inside of the grill outer wall **316**, and a plurality of grill portions **315***a*, which may extend from the grill outer wall **316** to the grill inner wall **317**. Spaces between the plurality of grill portions **315***a* may form the second discharge portion **305**.

As the second discharge portion **305** along with the first discharge portion **105** of the first blowing device **100** is provided in the air cleaner **10**, a discharge amount of air may be improved, and air may be discharged in various directions.

Each of the grill outer wall **316** and the grill inner wall **317** may have a cylindrical shape, and the grill outer wall **316** may surround the grill inner wall **317**. In addition, the second discharge portion **305** may be formed on or at an upper side of the housing flow path **314**. Thus, air having passed through the housing flow path **314** may be discharged outside of the air cleaner **10** via the second discharge portion **305** of the discharge grill **315**.

The discharge grill **315** may further include a depression portion or depression **318** which may have a shape depressed at a substantially center portion of the discharge grill **315** and support the display device **600**. The depression portion **318** may be provided in or at a lower end portion or end of the grill inner wall **317**.

A supporting rib **318***a* that supports a display PCB **610** of the display device **600** may be provided in the depression portion **318**. The supporting rib **318***a* may protrude in the upward direction from an upper surface of the depression portion **318**. The grill inner wall **317** may support a lower side of the display PCB **610**.

The display device **600** may include a PCB assembly **601**. The PCB assembly **601** may include the display PCB **610**, on which an illumination source may be provided, a reflector **620**, which may be coupled to an upper side of the display PCB **610** and concentrate light irradiated from the illumination source in the upward direction such that displayed information may be displayed as various characters, numbers, or symbols, and a diffusing plate **630**, which may be supported on the discharge grill **315** and guide light irradiated from the illumination source to be refracted and then face an upper surface of the display device **600**, that is, a rim portion or rim **650** of a display screen **602**.

An axial flow fan may be included in the third fan **330**. That is, the third fan **330** may be operated in order to axially discharge air which is axially introduced. That is, the air which flows toward the third fan **330** in the upward direction via the second fan **260**, the first air flow path **272***a* of the third air guide **270**, and the discharge flow path **282***a* of the second discharge guide **280** may be discharged from the third fan **330**, and thus, may be discharged to the outside through the second discharge portion **305**, which may be positioned on the upper side of the third fan **330**.

The third fan **330** may include a hub **331** having a shaft coupling portion to which a rotational shaft **336** of the third fan motor **335**, which may be an axial flow motor, may be

coupled, and a plurality of blades **333**, which may be coupled to the hub **331** in the circumferential direction. The third fan motor **335** may be coupled to a lower side of the third fan **330** and may be disposed or provided inside of the third motor housing **337**.

The first fan motor **165** and the second fan motor **265** may be disposed or provided in series relative to a longitudinal direction of the air cleaner **10**. The second fan motor **265** and the third fan motor **335** may be disposed or provided in series relative to a longitudinal direction of the air cleaner **10**. In summary, rotational shafts of the first fan motor **165**, the second fan motor **265**, and the third fan motor **335**, or the first fan **160**, the second fan **260**, and the third fan **330** may be positioned on a same axis in the longitudinal direction.

The flow adjusting device **300** may include a flow guide portion or guide **320**, which may be coupled to a lower side of the third fan housing **310**, and thus, guide the air passing by the second discharge guide **280** to the third fan housing **310**. The flow guide **320** may include an introduction grill **325** that guides the air introduction to the third fan housing **310**. The introduction grill **325** may have a concave shape in the downward direction.

A shape of the second discharge grill **288** of the second discharge guide **280** may be formed in a concave shape in the downward direction corresponding to a shape of the introduction grill **325**. The introduction grill **325** may be seated on an upper side of the second discharge grill **288**. By this configuration, the introduction grill **325** may be stably supported by the second discharge grill **288**.

The flow adjusting device **300** may further include a rotation guide device or guide **350**, which may be installed or provided on or at a lower side of the flow guide **320**, and thus, may guide rotation in the lateral direction and rotation in the vertical direction of the flow adjusting device **300**. The rotation in the lateral direction may be referred to as a "first direction rotation" and the rotation in the vertical direction may be referred to as a "second direction rotation."

The rotation guide **350** may include a guide main body **351**, which may be coupled to the movement guide **320**. The guide main body **351** may include a lower surface portion **351***a*, at which the first and second guides may be installed or provided, and a rim portion or rim **351***b*, which may be provided on or at a rim of the lower surface portion **351***a* and protrude in the downward direction.

The rotation guide **350** may include a first guide mechanism or guide that guides the first direction rotation of the flow adjusting device **300**, and a second guide mechanism or guide that guides the second direction rotation of the flow adjusting device **300**. The first guide mechanism may include a first gear motor **363** that generates a drive force, and a first gear **360** rotatably coupled to the first gear motor **363**. For example, the first gear motor **363** may include a step motor, a rotational angle of which may be easily controlled.

The first gear **360** may be coupled to a motor shaft **363***a* of the first gear motor **363**. The first guide may further include a first gear shaft **362** that extends in the downward direction, that is, toward the third air guide **270** or the second discharge guide **280** from the first gear **360**. The first gear **360** may be geared to the first rack **276** of the third air guide **270**. A plurality of gear teeth may be formed in the first gear **360** and the first rack **276**. When the first gear motor **363** is driven, the first gear **360** may rotate, and thus, link to the first rack **276**. The third air guide device **270** may be fixed, and thus, the first gear **360** may be movable.

The shaft guide groove **277** of the third air guide **270** may guide movement of the first gear **360**. That is, the first gear shaft **362** may be inserted into the shaft guide groove **277**. The first gear shaft **362** may be moved in the circumferential direction along the shaft guide groove **277** in a rotation process of the first gear **360**.

The first guide may include the rotational shaft **354**, which may form a rotational center of the flow adjusting device **300**. The first gear **360** and the first gear shaft **362** may be rotated along a rotating radius, which may be set about the rotational shaft **354**. The set rotating radius may be referred to as a "first rotating radius."

The first rack **276** and the shaft guide groove **277** may have a length corresponding to a rotational amount or rotational angle of the flow adjusting device **300**. A length in the circumferential direction of the first rack **276** and the shaft guide groove **277** may be formed slightly greater than a distance in the circumferential direction which the flow adjusting device **300** rotates. Accordingly, in a process of movement of the first gear **360**, the first gear **360** may be prevented from being separated from the first rack **276**. In addition, in a process of movement of the first gear shaft **362**, the first gear shaft **362** may be prevented from interfering with the end portion of the shaft guide groove **277**.

The rotational shaft **354** may be provided on a lower surface portion **351***a* of the guide main body **351**. That is, the rotational shaft **354** may protrude in the downward direction from the lower surface portion **351***a*. The rotational shaft **354** may be inserted or provided in a shaft insertion portion **284** of the second discharge guide **280**, and may be rotated in the shaft insertion portion **284**. That is, when the first gear **360** rotates, the first gear shaft **362** and the first gear **360** may rotate about the rotational shaft **354** in the circumferential direction. The rotational shaft **354** may rotate in the shaft inserting portion **284**. Accordingly, the flow adjusting device **300** may be rotated in a first direction, that is, in the clockwise direction or in the counterclockwise direction about the longitudinal direction as the axial direction.

The first guide may include bearings **353**, and **355** that easily rotate the flow adjusting device **300** in the first direction. The bearings **353**, **355** may reduce a friction force generated in the rotational process of the flow adjusting device **300**. The bearings **353** and **355** include a first bearing **353** provided on a lower surface of the rotational guide **350**. For example, the first bearing **353** may include a ball bearing.

In addition, the first guide may include a bearing supporting portion or support **354** that protrudes in the downward direction from the lower surface portion **351***a* to support the first bearing **353**. The bearing supporting portion **354** may be formed a set or predetermined length, to guide the first bearing **353** to be disposed at a position at which the first bearing **353** is capable of being in contact with the rotational guide plate **283**.

The rotational guide plate **283** may include a bearing groove **285**, into which the first bearing **353** may be inserted. In a process of rotation of the flow adjusting device **300** in the first direction, the first bearing **353** may be movable with the first bearing being inserted into the bearing groove **285**. The first bearing **353** may be rotated along a rotating radius which is set about the rotational shaft **354**. That is, the set rotating radius may be referred to as a "second rotating radius". The second rotating radius may be formed to be less than the first rotating radius. That is, a distance from the rotational shaft **354** to the first bearing **353** may be shorter than a distance from the rotational shaft **354** to the first gear shaft **352**. According to this configuration, the lower surface portion **351***a* may be rotated by being stably supported by the third air guide **270** and the second discharge guide **280**.

When the first gear shaft **362** is moved along the shaft guide groove **277**, the first bearing **353** may be moved along the bearing groove **285**. In order to allow the first gear shaft **362** and the first bearing **353** to be smoothly moved, a set curvature of the shaft guide groove **277** and a set curvature of the bearing groove **285** may be equal to each other.

The bearings **353** and **355** may include a second bearing **355**. The second bearing **355** may be rotatably installed or provided at the rim portion **351***b*. A bearing insertion portion **351***c*, to which the second bearing **355** may be coupled, may be formed at the rim portion **351***b*. The bearing insertion portion **351***c* may be depressed in the upward direction from a lower surface of the rim portion **351***b*. In addition, a plurality of second bearing **355** may be provided. The second bearing **355** may be in contact with the discharge inner wall **282** of the second discharge guide **280**, that is, the inner circumferential surface of the discharge inner wall **282** may form a contacting surface of the second bearing **355**. The flow adjusting device **300** may be easily rotated in the first direction by the second bearing **355** rotating about the rotational shaft **354** along the inner circumferential surface of the discharge inner wall **282**.

The first direction rotation of the flow adjusting device **300** will be briefly described with reference to FIG. **9**. If the first gear motor **363** is operated, the first gear **360** may be rotated. When viewed from a top, the first gear motor **363** may be rotated in the clockwise direction or the counterclockwise direction. Accordingly, the first gear **360** may be rotated in the clockwise direction or the counterclockwise direction.

For example, if the first gear motor **363** is rotated in the clockwise direction, the first gear **360** and the first gear shaft **362** may be moved in the counterclockwise direction along the shaft guide groove **277**. On the other hand, if the first gear motor **363** is rotated in the counterclockwise direction, the first gear **360** and the first gear shaft **362** may be moved in the clockwise direction along the shaft guide groove **277**.

As the first gear **360** is moved in the clockwise direction or in the counterclockwise direction, the flow adjusting device **300** may be rotated in a same direction as a movement direction of the first gear **360**. In this process, the first bearing **353** may be moved along the bearing groove **285**, and the second bearing **355** may be moved along the inner circumferential surface of the discharge inner wall **282**. Accordingly, the flow adjusting device **300** may be stably rotated along a set flow path in the lateral direction.

FIG. **11** is an exploded perspective view of the flow adjusting device according to an embodiment. FIG. **12** is an exploded perspective view of a drive portion and a fixing portion of the flow adjusting device according to an embodiment. FIG. **13** is a view illustrating a state in which a second rack and a second gear, which are provided in the flow adjusting device, are interlocked with each other according to an embodiment.

Referring to FIGS. **7**, **11**, and **12**, the flow adjusting device **300** according to an embodiment may include a second guide mechanism or guide that guides rotation in the vertical direction of the flow adjusting device **300**. The second guide may include a fixing guide member or guide **352**, which may be fixed to the guide main body **351**. The rotational shaft **354** may be provided in a lower surface of the fixing guide **352**.

The fixing guide **352** may support a lower side of the rotation guide **370**, and include a first guide surface **352***a*, which may guide the second direction rotation of the rotation guide **370**. The first guide surface **352***a* may form at least a portion of an upper surface of the fixing guide **352**, and may extend rounded in the upward direction, corresponding to a rotational path of the rotation guide **370**.

The fixing guide **352** may further include a first guide bearing **359**, which may reduce a friction force generated at a time of rotating movement of the rotation guide **370** by being in contact with the rotation guide **370**. The first guide bearing **359** may be positioned to or at a side of the first guide surface **352***a*.

The fixed guide **352** may further include a second gear inserting portion **352***b*, into which the second gear **365** may be inserted for rotation of the rotation guide **370**. The second gear inserting portion **352***b* may be formed on or at one side of the first guide surface **352***a*. For example, the second gear inserting portion **352***b* may have a shape at least a portion of the first guide surface **352***a* being cut. The second gear **365** may be positioned to or at a lower side of the first guide surface **352***a* and at least a portion of the second gear **365** may project to an upper side of the second gear inserting portion **352***b* through the second gear inserting portion **352***b*.

The second guide may include a second gear motor **367**, which may be coupled to the second gear **365** and provide a drive force. For example, the second gear motor **367** may include a step motor. The second guide may include a second gear shaft **366** that extends from the second gear motor **367** to the second gear **365**. When the second gear motor **367** is driven, the second gear shaft **366** and the second gear **365** may be rotated together.

The second guide may further include a rotation guide **370**, which may be provided on or at an upper side of the fixing guide **352**. The rotation guide **370** may be coupled to a lower side of flow guide **320**.

That is, the rotation guide **370** may include a main body portion or body **371**, which may be supported by the fixing guide **352**. The main body portion **371** may include a second guide surface **372**, which may move along the first guide surface **352***a*. The second guide surface **372** may be rounded corresponding to a curvature of the first guide surface **352***a*.

The rotation guide **370** may further include a second guide bearing **375**, which may reduce a friction force generated at a time of rotating movement of the rotation guide **370** by being in contact with the fixing guide **352**. The second guide bearing **375** may be positioned on or at a side of the second guide surface **372**.

The rotation guiding **370** may include a second rack **374** linked to the second gear **365**. A plurality of gear teeth may be formed in the second gear **365** and the second rack **374**, and the second gear **365** and the second rack **374** may be geared to each other through the plurality of gear teeth.

If the second gear motor **367** is driven, the rotation guide **370** rotates in the vertical direction by linkage of the second gear **365** and the second rack **374**. Accordingly, the flow adjusting device **300** may perform the second direction rotation according to the movement of the rotation guide **370**.

The second direction rotation of the flow adjusting device **300** will be described with reference to FIG. **13**.

If the second gear motor **367** is operated, the second gear **365** may be rotated. The second gear motor **367** may be rotated in the clockwise direction or in the counterclockwise direction relative to the radial direction. Accordingly, the second gear **365** may be rotated in the clockwise direction or in the counterclockwise direction.

For example, if the second gear motor **367** is rotated in the clockwise direction, the second gear **365** may be rotated in the clockwise direction, and the second rack **374** rotated in the counterclockwise direction by linkage with the second gear **365**. As the second rack **374** is rotated, the rotation

guide **370** and the flow guide **320** may be rotated together. Finally, the fan housing **310** may be rotated in the counterclockwise direction.

On the other hand, if the second gear motor **367** is rotated in the counterclockwise direction, the second gear **365** may be rotated in the counterclockwise direction, and the second rack **374** rotated in the clockwise direction by linkage with the second gear **365**. As the second rack **374** is rotated, the rotation guide **370** and the flow guide **320** may be rotated together. Finally, the fan housing **310** may be rotated in the clockwise direction. Accordingly, the flow adjusting device **300** may be stably rotated along a set path in the vertical direction.

FIGS. **14** and **15** are views illustrating a state in which the flow adjusting device is located at a second position according to an embodiment. FIG. **16** is a view illustrating a state in which the flow adjusting device of FIG. **14** is rotated in direction A.

FIGS. **14** and **15** illustrate a state in which the flow adjusting device **300** protrudes to the upper side of the second discharge guide **280**, that is, a state (second position) in which the fan housing **310** is inclined in the upward direction as the rotation guide **370** is rotated in the upward direction. As the flow adjusting device **300** is vertically rotated in a direction "B" shown in FIG. **14**, the flow adjusting device **300** may be moved to the first position (see FIG. **1**) or the second position. When the flow adjusting device **300** is located at the first position, the introduction grill **325** is disposed on the upper surface of the second discharge grill **288**. On the other hand, when the flow adjusting device **300** is located at the second position, the introduction grill **325** is spaced apart from the upper surface of the second discharge grill **288** in the upward direction.

The third fan **330** may be selectively operated based on whether the flow adjusting device **300** is located at the first position or the second position. That is, referring to FIG. **23**, the first and second fans **160** and **260** may be rotated to generate air flow in the state in which the flow adjusting device **300** is located at the first position. Air suction and discharging (first flow) at a lower portion of the air cleaner **10** may be generated by operation of the first fan **160**. In addition, air suction and discharging (second flow) at an upper portion of the air cleaner **10** may be generated by the operation of the second fan **260**. The first flow and the second flow may be separated from each other by the dividing device **400**.

In addition, the third fan **330** may be selectively operated. If the third fan **330** is operated, the second flow may be more strongly generated. That is, a strong discharge air current at the upper portion of the air cleaner **10** may be generated by the second fan **260** and the third fan **330**, and may be discharged through the second discharge portion **305**. The third fan **330** may not be operated.

In the state in which the flow adjusting device **300** is located at the second position, the first and second fans **160** and **260** may be rotated to generate the first flow and the second flow. In addition, the third fan **330** may be operated. The second position is a position in which the airflow control device **300** is inclined by a set or predetermined angle in the upward direction, relative to the first position of the flow adjusting device **300**. For example, the set or predetermined angle may be about 60 degrees.

That is, referring to FIG. **24**, by the operation of the third fan **330**, at least a portion of air which is discharged through the second discharge guide **280** may be introduced to the inside of the third fan housing **310**, and may be discharged from the second discharge portion **305** via the third fan **330**. Accordingly, purified air may reach a position distant from the air cleaner **10**.

In the state in which the flow adjusting device **300** is located at the second position, the flow adjusting device **300** may be rotated in the lateral direction, relative to the side direction. FIG. **14** illustrates a state in which the flow adjusting device **300** is located to face in one direction (left direction relative to FIG. **14**) in the state in which the flow adjusting device **30** is located at the second position. The one direction may be a direction which faces at 45 degrees to a left or first side, relative to the front of the air cleaner **10**.

The flow adjusting device **300** may be located to face in another direction in the state in which the flow adjusting device **300** is located at the second position. The other direction may be a face which faces at 45 degrees to a right or second side, relative to the front of the air cleaner **10**. That is, the rotation angle of the flow adjusting device **300** may be about 90 degrees.

As described above, the flow adjusting device **300** may be rotated in the lateral direction relative to the axial direction, and thus, discharge air current may be blown a long distance in various directions, relative to the air cleaner **10**.

FIG. **17** is an exploded perspective view of the display device which is coupled to the discharge grill according to an embodiment. FIG. **18** is a view illustrating a state in which a PCB assembly is coupled to the discharge grill according to an embodiment. FIG. **19** is an exploded perspective view of the PCB assembly of FIG. **18**. FIG. **20** is a view of an upper surface of a display device according to an embodiment. FIG. **21** is a view of a lower surface of the PCB assembly according to an embodiment.

Referring to FIGS. **17** to **21**, the display device **600** according to this embodiment may be installed or provided at an upper portion of the air cleaner **10**. The display screen **602** of the display device **600** may form at least a portion of the upper surface of the air cleaner **10**.

The display device **600** may be installed or provided in or on the discharge grill **315**. The depression portion **318**, which may be a depressed in the downward direction may be provided at a substantially center portion of the discharge grill **315**, and the plurality of grill portions **315***a* may extend toward the outside in the radial direction from the depression portion **318**. In addition, the display device **600** may be disposed or provided on or at an upper side of the depression portion **318**.

The display device **600** may include the PCB assembly **601**. The PCB assembly **601** may include the display PCB **610** on which a plurality of illumination sources **651** and **655** may be provided, and a reflector **620**, which may be coupled to an upper side of the display PCB **610** to allow light irradiated from the plurality of illumination sources **651** to be concentrated toward the display screen **602**.

The plurality of illumination sources **651** and **655** may include a first illumination source **651** that displays operation information of the air cleaner **10** and a second illumination source **655** that displays a rim portion or rim of the display screen **602** of the display device **600**. The display screen **602** may be a set or predetermined area (hereinafter, referred to as a "display area") in which the information may be displayed, and may be formed on an upper surface of the display device **600**. In addition, the rim or portion of the display screen **602** may form a boundary of the display area.

The display PCB **610** may include a board main body **611**, which may have a substantially circular shape. The board main body **611** may include a main body front surface portion or surface **611***a*, on which the first illumination

source **651** may be installed or provided, and a main body rear surface portion or surface **611***b*, on which the second illumination source **655** may be installed or provided.

A plurality of first illumination sources **651** may be provided on the main body front surface portion **611***a*, corresponding to a shape of a displayed content. In addition, a plurality of second illumination sources **655** may be provided. The plurality of second illumination sources **655** may be arranged along a rim portion or rim of the main body rear surface portion **611***b*. For example, the plurality of second illumination sources **655** may be arranged in a circular shape.

The reflector **620** may include a reflector main body **621** and a through hole **623**, which may be formed in the reflector main body **621** and allow light irradiated from the first illumination source **651** to be concentrated in the upward direction. The reflector main body **621** may be made of an opaque material through which transmission of light may be limited, or an opaque material may be coated on the reflector main body **621**.

A reflector film **625** may be provided on or at an upper side of the reflector **620**. The reflector film **625** may include a pattern display portion display **626** at or on which a content of displayed information, that is, a predetermined character, number, or symbol, may be displayed. The light concentrated through the reflector **620** may act on the pattern display portion **626**, thereby implementing predetermined information. The pattern display portion **625** may be made of a transparent material. For example, as shown in FIG. **19**, the pattern display portion **626** may include characters conveying information to a user, such as "smell," "dust," "fine dust," and "filter replacement," a pattern **888** capable of displaying numbers, and/or a symbol that represents a strength of a blowing amount, for example.

The first illumination source **651** may be disposed or provided at a position corresponding to the pattern display portion **626**. For example, the first illumination source **651** may be disposed or provided on or at a lower side of the pattern display portion **626**. As a plurality of pattern display portions **626** may be provided to implement various patterns, a plurality of first illumination sources **651** may be provided corresponding to the plurality of pattern display portions **626**. Light irradiated from the first illumination source **651** may be exposed to the outside by passing through the pattern display portion **626**. In addition, various information may be displayed by on/off control of the plurality of first illumination sources **651**.

The display device **600** may include the diffusing plate **630**, which may surround an outside of the PCB assembly **601**. The diffusing plate **630** may be a component that forms the rim portion or rim **650** of the display screen **602** by diffusing light irradiated from the second illumination source **655**.

The diffusing plate **630** may be disposed or provided along the rim portion of the depression portion **318**. That is, the diffusing plate **630** may include a plate main body **631**, which may surround the display PCB **610** and an illumination accommodating portion **635**, which may protrude from an inner circumferential surface of the plate main body **631** to allow the second illumination source **655** to be accommodated therein. The plate main body **631** may have a ring shape, and may be supported by the discharge grill **315**. In addition, the plate main body **631** and the illumination accommodating portion **635** may be integrally formed.

The plate main body **631** and the illumination accommodating portion **635** may be made of a translucent material which is capable of refracting or diffusing light. For example, the plate main body **631** and the illumination accommodating portion **635** may be made of an acrylic material.

The plate main body **631** may form the rim portion **650** of the display screen **602**. That is, an upper portion of the plate main body **631** may be exposed to the upper surface of the air cleaner **10**, and light irradiated from the second illumination source **655** may be diffused through the illumination accommodating portion **635** and the plate main body **631**. In addition, the diffused light may move to the upper portion of the air cleaner **10**, thereby forming the rim portion **650**.

As the plate main body **631** and the illumination accommodating portion **635** are made of a translucent material, the rim portion **650** may be implemented using soft light. Thus, a display screen having a comfortable feeling may be implemented.

The display device **600** may further include a display cover **640**, which may be provided on or at an upper side of the PCB assembly **601**. The display cover **640** may be understood as a component that supports the outside of the display PCB **610** and maintains a cover film **645** flat. The display cover **640** may be made of an opaque material to prevent transmission of light.

A cover hole **641**, which may have a shape corresponding to the reflector film **625**, may be formed in the display cover **640**. According to the configuration of the cover hole **641**, although the display cover **640** is coupled to the reflector **620**, the reflector film **625** may be exposed in the upward direction.

The cover film **645** may be provided on or at an upper side of the display cover **640**. For example, the cover film **645** may be attached to an upper surface of the display cover **640**. The cover film **645** may be made of a translucent material to allow a portion of light transferred from the PCB assembly **601** to be transmitted therethrough. For example, the translucent material may include an acrylic or polymethyl methacrylate (PMMA)resin. The cover film **645** may be provided, so that information displayed through the display device **600** may be prevented from being extremely dazzling. The cover film **645** may include a film display portion or display **646**, which may allow a user to input a predetermined command or display a portion of a plurality of operation information of the air cleaner **10**.

FIGS. **22** to **24** are views illustrating a state in which air flows in the air cleaner of FIG. **1**.

First, the flow of air according to driving of the first blowing device **100** will be described. If the first fan **160** is driven, indoor air may be suctioned inside of the first case **101** through the first suction portion **102** and the base suction portion **103**. The suctioned air may pass through the first filter **120**, and foreign materials in the air may be filtered in this process. In a process in which air passes through the first filter **120**, the air may be suctioned in the radial direction of the first filter **120**, filtered, and then flow in the upward direction.

The air having passed through the first filter **120** may flow to the upper side in the radial direction while passing through the first fan **160** and stably flow in the upward direction while passing through the first air guide **170** and the second air guide **180**. Air passing through the first air guide **170** and the second air guide **180** may pass by the first discharge guide **190** and flow in the upward direction through the first discharge portion **105**. Air which is discharged through the first discharge portion **105** may be guided by the dividing plate **430** positioned at the upper side of the first discharge guide **190**, and thus, may be discharged outside of the air cleaner **10**.

If the second fan **260** is driven, indoor air may be suctioned inside of the second case **201** through the second suction portion **202** and the base suction portion **103**. The suctioned air may pass through the second filter **220**, and foreign materials in air may be filtered in this process. In a process in which air passes through the second filter **220**, the air may be suctioned in the radial direction of the second filter **220**, filtered, and then flow in the upward direction.

Air which passes through the second filter **220** may flow to the upper side in the radial direction while passing through the second fan **160**, and stably flow in the upward direction while passing through the third air guide **270** and the second discharge guide **280**. Air having passed through the third air guide **270** and the second discharge guide **280** may be discharged through the second discharge portion **305** via the flow adjusting device **300**.

The flow adjusting device **300** may be rotated provided in the vertical direction by the second guide. For example, as shown in FIGS. **22** to **24**, if the flow adjusting device **300** is located at or in the first position, air which is discharged from the flow adjusting device **300** may flow in the upward direction. On the other hand, if the flow adjusting device **300** is located at or in the second position, air which is discharged from the flow adjusting device **300** may flow toward the front upper side. By the flow adjusting device **300**, an air volume of air which is discharged from the air cleaner **10** may be increased, and purified air may be supplied to a position distant from the air cleaner **10**.

That is, if the third fan **330** of the flow adjusting device **300** is driven, at least a portion of air which is discharged from the second discharge guide **280** may be introduced to the inside of the third fan housing **310**. Then, the introduced air may pass through the third fan **330**, and may be discharged to the outside through the second discharge portion **305**.

The flow adjusting device **300** may be rotated in the lateral direction by the first guide in the state in which the flow adjusting device **300** is located at the second position. For example, as shown in FIGS. **14** and **15**, when the flow adjusting device **300** faces the front upper side, air which is discharged through the second discharge portion **305** may flow toward the front upper side. On the other hand, as shown in FIG. **16**, when the flow adjusting device **300** faces the rear upper side, air which is discharged through the second discharge portion **305** may flow toward the rear upper side.

According to this action, air which is discharged from the air cleaner **10** does not simply flow in the upward direction, but rather, may flow in the frontward direction, and thus, an air current toward a space relatively distant from the air cleaner **10** may be generated. As the separate third fan **330** is provided in the flow adjusting device **300**, a blowing force of the discharged air may be increased.

In addition, the flow adjusting device **300** is capable of performing the first direction rotation, and thus, air may be discharged to both sides of the front of the air cleaner **10**. Accordingly, an air current may be provided toward a relatively wide room space.

The flow adjusting device **300** may be selectively operated based on an operation mode of the air cleaner **10**. When the air cleaner **10** is operated in a general operation mode (first operation mode), the flow adjusting device **300** may be located at or in the first position in which the flow adjusting device **300** is laid out, as shown in FIGS. **22** and **23**. Then, the first and second blowing devices **100** and **200** may be driven, thereby forming a plurality of independent air currents.

That is, if the first blowing device **100** is driven, air may be suctioned through the first suction portion **102** and the base suction portion **103** and then discharged through the first discharge portion **105** by passing through the first filter **120** and the first fan **160**. In addition, if the second blowing device **200** is driven, air may be suctioned through the second suction portion **202** and pass through the third fan **330** via the second filter **220** and the second fan **260**. The third fan **330** may be driven to have a rotation number corresponding to a rotation number of the second fan **260**, thereby guiding air flow. The air current may be directed toward both sides of the front of the air cleaner while the flow adjusting device **300** is performing the first direction rotation in the state in which the flow adjusting device **300** is located at the first position.

On the other hand, when the air cleaner **10** is operated in a flow conversion mode (second operation mode), the flow adjusting device **300** may protrude from the upper end portion of the air cleaner **10** by being rotated in the upward direction, as shown in FIG. **24**. In the flow conversion mode, driving of the first and second blowing devices **100** and **200** may be identical to driving of the first and second blowing devices **100** and **200** in the general operation mode.

Then, the third fan **330** may be driven, and accordingly, at least a portion of air having passed through the second fan **260** and the discharge flow path **282***a* of the second discharge guide **280** may be introduced to the third fan housing **310**. In addition, at least a portion of the introduced air may be discharged toward the front upper side or the rear upper side of the air cleaner **10** while passing through the third fan **330**.

According to embodiments disclosed herein, a suction capacity may be improved as the suction portion is formed along an outer circumferential surface of a cylindrical case and a structural resistance of the case may not be generated in an air suction process. In addition, discharge of air in the upward direction may be guided through the second blowing device and discharge of air in the frontward direction may be guided by the flow adjusting device, which may be provided on or at an upper side of the second blowing device. Discharge of air in the lateral direction may be guided, in a process of rotating of the flow adjusting device. Finally, an air cleaning function of an indoor space may be improved as discharge of air in various directions may be guided relative to the air cleaner and a discharge air flow may be formed to extend a long distance from the air cleaner. A discharge air flow may be easily generated toward a circumferential space of a person in a room whether the person in the room sitting down or standing up.

In addition, as the flow adjusting device may include a first guide mechanism or guide which guides rotation in a lateral direction and a second guide mechanism or guide which guides rotation in vertical direction, the air flow control device may control a discharge air current while being rotated in the lateral direction by operation of the first guide mechanism in a state in which the air flow control device is located at a first position at which the air flow control device is laid out by the operation of the second guide mechanism or a second position at which the air flow control device is erected or at an inclined by the operation of the second guide mechanism. In addition, as a third fan may be provided in the air flow control device, air may be discharged by adding a flow force generated by the third fan to air which flows through the second blowing device. Thus, a strong discharge air current is capable of being generated, so that an air current may reach a position distant from the air cleaner.

As each of the first guide mechanism and the second guide mechanism includes a gear motor and a gear, rotation in the vertical direction or the lateral direction of the air flow control device may be easily performed. Further, a display device or device may be provided at an upper portion of the air flow control device, so that operation information of the air cleaner may be easily recognized at the outside. In particular, the display device may be exposed to the outside not only when the air flow control device is in an inclinedly erected state (second position) relative to an axial direction, but also when the air flow control device is in a laid out state (first position) relative to the axial direction, so that operation information of the air cleaner may be easily identified.

The air flow control device may include a discharge grill, and a depression portion provided at a center portion of the discharge grill. Thus, the display device may be installed, and a discharge portion through which air may be discharged may be formed along a circumference of the depression portion. Accordingly, it is possible to improve a spatial utilization of the air cleaner. Further, it is possible to prevent flow of air discharged through the discharge portion from interfering by the display device.

The display device may include a PCB assembly, that is, a display PCB having a first illumination source and a reflector which may be coupled to the display PCB, so that it is possible to easily implement various characters, numbers, or symbols relative to the operation of the air cleaner. A second illumination source may be provided on a lower surface of the display PCB, and a diffusing plate having an illumination accommodating portion which accommodates the illumination source therein may be provided on a lower side of the display PCB, so that light irradiated from the illumination source may be refracted through the diffusing plate to be easily moved to a rim portion of a front surface of the display device. Finally, it is possible to obtain an effect that information displayed through the display device may be visually emphasized. Accordingly, a user may easily identify information even in a slightly distant distance.

Further, a blowing capacity of the air cleaner may be improved as a plurality of blowing devices may be provided. The air which flows in the radial direction through a centrifugal fan may be easily guided toward the discharge portion in the upward direction, as the centrifugal fan for increasing the blowing capacity of the air cleaner and the air guide device or guide which may be disposed or provided on or at an outlet side of the centrifugal fan may be provided.

Phenomena that interference between the air flows may be prevented as the air flows which are independent from each other may be generated through the first blowing device and the second blowing device. Accordingly, the air flowing capacity may be improved.

Embodiments disclosed herein provide an air cleaner which is capable improving a suction capacity of air which is suctioned to the air cleaner. Embodiments disclosed herein further provide an air cleaner which is capable of sufficiently suctioning air around a person in a room whether the person in the room sitting down or standing up by including a suction flow path which is directed from a circumferential direction of the air cleaner to an inside portion thereof and a suction flow path through which air is introduced through an upper portion and a lower portion of the air cleaner.

Embodiments disclosed herein also provide an air cleaner which is capable of discharging air which is discharged from the air cleaner in various directions and sending the discharged air a long distance. In particular, embodiment disclosed herein provide an air cleaner which is capable of easily discharging air toward a surrounding space of a person in a room whether the person in the room sitting down or standing up by a discharge air flow being easily generated in an upward direction, a frontward direction, and lateral direction of the air cleaner.

Embodiments disclosed herein provide an air cleaner which includes a display device or display capable of easily displaying operation information of the air cleaner to the outside. Embodiments disclosed herein also provide an air cleaner in which the display device may be provided in a rotatable air flow control device, so that a user may easily identify operation information of the air cleaner regardless of a position to which the air flow control device is rotated.

Embodiments disclosed herein provide an air cleaner a blowing capacity of which may be increased. Embodiments disclosed herein further provide an air cleaner in which an air guide device or guide is provide which allows air passing through a centrifugal fan to easily flow toward a discharge portion in an upward direction in a case of adopting the centrifugal fan in order to increase a blowing capacity. Embodiments disclosed herein also provide an air cleaner which improves purification capacity of a filter and in which replacement of the filter is easily performed.

Embodiments disclosed herein additionally provide an air cleaner in which a filter may be easily installed or provided without an installation space for installing the filter in an inside portion of the air cleaner being additionally provided.

Embodiments disclosed herein provide an air cleaner that may include an air cleaning module that includes a main fan to generate an air flow and a filter member or filter to purify air; and an air flow control device or controller movably provided in or at one side of the air cleaning module. The air flow control device may include a sub-fan to control a direction of air flow passing through the air cleaning module. When the air flow control device is in a first location, in a case in which the sub-fan is driven, air may be discharged in an upward direction from the air flow control device. When the air flow control device is in a second location, in a case in which the sub-fan is driven, air may be discharged in a front upward direction from the air flow control device.

The air flow control device may include a guide device or guide to guide a first directional rotation or a second directional rotation of the air flow control device. The first directional rotation may be a rotation of a clockwise direction or a counterclockwise direction, with respect to an axial direction. The second directional rotation may be a rotation of upper or lower direction.

The guide device may include a first guide device to guide the first directional rotation. The air cleaner may further include a third air guide device disposed in an outlet side of the main fan and having a first air flow path. The third air guide device may include an outer wall configured to form an outer circumference surface of the third air guide device, and an inner wall configured disposed in an inner side of the outer wall, the inner wall being configured to form an inner circumference surface of the third air guide device. The first air flow path may be formed between an inner circumference surface of the outer wall and an outer circumference surface of the inner wall.

The first guide device may include a first gear motor which is able to rotate in both directions, and a first gear configured to be connected to the first gear motor to rotate and to have a first gear shaft. The third air guide device may include a first rack which is interlocked with the first gear and extends in a rounded shape in a circumferential direction.

The first guide device may further include a rotating shaft which forms a center of the first direction rotation of the air flow control device. The first gear may rotate with a radius of rotation set around the rotating shaft.

The air cleaning may further include a second discharge guide device or guide disposed or provided in the outlet side of the third air guide device, the second discharge guide device being configured to form a discharging flow path through which the air passing through the first air flow path may flow.

The second discharge guide device may include a discharge outer wall configured to form an outer circumference surface of the second discharge guide device, and a discharge inner wall disposed or provided in or at an inner side of the discharge outer wall, the discharging inner wall being configured to form an inner circumference surface of the second discharge guide device. The discharge flow path may be formed between the inner circumference surface of the discharge outer wall and the outer circumference surface of the discharge inner wall.

The first guide device may include a bearing to guide a first direction rotation of the air flow control device. The bearing may include a first bearing which moves along a bearing groove of the second discharging guide device, and a second be discharging guide bearing which moves along an inner circumferential surface of the second discharging guide device. The guide device may include a second guide device or guide to guide the second direction rotation.

The second guide device may include a second gear motor which is rotatable in both directions, and a second gear which is connected to the second gear motor to rotate. The second guide device may include a rotation guide member configured to be rotatable in upward and downward directions, and a fixed guide member including having a first guide surface to support a lower side of the rotation guide member.

The fixed guide member may further include a first guide bearing contacted with the rotation guide member to reduce a friction occurred when the rotation guide member rotates. The fixed guide member further may include a second gear insertion part to which the second gear inserts. The second gear may extend upward from the first guide surface, passing through the second gear insertion part.

The first location may be where a top of the air flow control device is disposed vertically with respect to an axial direction. The second location may be where the top of the air flow control device is disposed with a slope or incline with respect to the axial direction.

The air flow control device may include a display device or display to display operation information.

Any reference in this specification to "one embodiment," "an embodiment," "example embodiment," etc., means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment. The appearances of such phrases in various places in the specification are not necessarily all referring to the same embodiment. Further, when a particular feature, structure, or characteristic is described in connection with any embodiment, it is submitted that it is within the purview of one skilled in the art to effect such feature, structure, or characteristic in connection with other ones of the embodiments.

Although embodiments have been described with reference to a number of illustrative embodiments thereof, it should be understood that numerous other modifications and embodiments can be devised by those skilled in the art that will fall within the spirit and scope of the principles of this disclosure. More particularly, various variations and modifications are possible in the component parts and/or arrangements of the subject combination arrangement within the scope of the disclosure, the drawings and the appended claims. In addition to variations and modifications in the component parts and/or arrangements, alternative uses will also be apparent to those skilled in the art.

What is claimed is:

1. An air cleaner, comprising:

an air cleaning module including a main fan and a discharge guide provided with a discharge grill through which air passing through the main fan is discharged; and

an air flow controller provided at a top surface of the air cleaning module and including:

a housing including a housing body in which an air discharge outlet provided at an upper opening of the housing body is formed and an introduction grill provided at a lower portion of the housing body;

an air flow controller fan provided within the housing body and the introduction grill, the housing being movable from an initial horizontal position in which the air flow controller directs air flow in a vertical direction to an inclined position in which the air flow controller directs air flow in a diagonal direction, wherein the introduction grill is laid on the discharge grill such that air discharged through the discharge grill is introduced into the introduction grill, and wherein the air flow controller fan within the housing moves with the housing from the initial horizontal position in which position the air flow of the air flow controller fan is directed in the vertical direction to the inclined position in which position the air flow of the air flow controller fan is directed in the diagonal direction.

2. The air cleaner of claim **1**, further including a rotation guide that guides rotation of the air flow controller in a first direction or a second direction, and wherein the first direction is a clockwise direction or a counterclockwise direction, with respect to an axial direction of the air flow controller and the second direction is an upward or downward direction.

3. The air cleaner of claim **2**, wherein the air cleaning module further includes:

an air guide provided between the main fan and the discharge guide and having a first air flow path, wherein the air guide includes:

an outer wall that forms an outer circumferential surface of the rotation guide; and

an inner wall provided at an inner side of the outer wall, the inner wall being configured to form an inner circumferential surface of the rotation guide, and wherein the first air flow path is formed between an inner circumferential surface of the outer wall and an outer circumferential surface of the inner wall.

4. The air cleaner of claim **2**, wherein the rotation guide includes:

a first gear motor configured to provide a drive force; and

a first gear rotatably connected to the first gear motor and having a first gear shaft; and a first rack interlocked with the first gear and extending in a rounded shape in a circumferential direction.

5. The air cleaner of claim **4**, wherein the rotation guide includes a rotational shaft which forms a rotational center of the air flow controller, and wherein the first gear rotates along a radius of rotation set around the rotational shaft.

6. The air cleaner of claim 4, wherein the discharge guide is provided at an outlet side of the air guide and is configured to form a discharge flow path through which the air passing through the first air flow path flows, wherein the discharge guide includes:

a discharge outer wall that forms an outer circumference surface of the discharge guide; and

a discharge inner wall provided at an inner side of the discharge outer wall, the discharge inner wall being configured to form an inner circumference surface of the discharge guide, wherein the discharge flow path is formed between an inner circumferential surface of the discharge outer wall and an outer circumference surface of the discharge inner wall.

7. The air cleaner of claim 6, wherein the rotation guide includes a bearing to guide the rotation of in the first direction of the air flow controller, and wherein the bearing includes:

a first bearing which moves along a bearing groove of the discharge guide; and

a second bearing which moves along an inner circumferential surface of the discharge guide.

8. The air cleaner of claim 6, wherein the rotation guide further includes:

a second gear motor configured to provide a drive force; and

a second gear rotatably connected to the second gear motor.

9. The air cleaner of claim 8, wherein the rotation guide further includes:

a rotatable guide configured to be rotatable in upper and lower directions; and

a fixed guide having a first guide surface to support a lower side of the rotatable guide, and wherein the fixed guide further includes a first guide bearing contacted with the rotation guide to reduce friction that occurs when the rotation guide rotates.

10. The air cleaner of claim 9, wherein the fixed guide further includes a second gear insertion portion in which the second gear is inserted, and wherein the second gear extends upward from the first guide surface, passing through the second gear insertion portion.

11. The air cleaner of claim 1, wherein the initial horizontal position is a position at which a top of the air flow controller extends horizontally with respect to an axial direction of the air flow controller, and wherein the inclined position is a position at which the top of the air flow controller extends at an angle with respect to the axial direction, and wherein the housing is prevented from moving to a vertical position at which the top of the air flow controller extends vertically with respect to the axial direction.

12. The air cleaner of claim 1, wherein a maximum angle of inclination of the housing is 60 degrees from the initial horizontal position.

13. The air cleaner of claim 1, wherein the housing of the air flow controller is cylindrical.

* * * * *